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American Journal of Diseases of Children

Vol. 17 JANUARY, 1919 No. 1

# STUDIES IN THE ADAPTATION OF AN ARTIFICIAL FOOD TO HUMAN MILK*

## II. A REPORT OF THREE YEARS' CLINICAL EXPERIENCE WITH THE FEEDING OF S. M. A. (SYNTHETIC MILK ADAPTED)

H. J. GERSTENBERGER, M.D., AND H. O. RUH, M.D.
IN COLLABORATION WITH M. J. BRICKMAN, M.D., H. J. LESLIE, M.D., R. J. OCHSNER, M.D.
CLEVELAND

Three years ago[1] the idea of adapting the fat of an artificial food like Friedenthal's milk to that of human milk was presented in a practical manner, but with clinical data that at that time were considered insufficient to warrant the drawing of conclusions as to its real practical value. The present report aims to give this data.

### OBJECT OF THE INVESTIGATION

The reasons for attempting to adapt the fat of an artificial milk to that of human milk are the following:

1. It is a universally recognized fact that infants, especially young infants, cannot take as high a percentage of cow's milk fat in their food as they can of breast milk fat. A clear substantiation of this fact can be had by consulting the percentage formulas given in the textbook of L. E. Holt. These formulas show two things: (*a*) that the amount of fat at the beginning is very small — from 0.5 to 1.7 per cent. for infants from birth to one month — while the same author[2] has found the fat content of human milk during the first

* Submitted for Publication, Aug. 10, 1918.

* Read before the Section on Diseases of Children at the Sixty-Ninth Annual Session of the American Medical Association, Chicago, June, 1918.

* We are deeply indebted to Mr. H. M. Hanna and Mr. S. M. Mather for their interest in the work and their help in purchasing the necessary equipment.

* From the Babies' Dispensary and Hospital, the Municipal Department of Child Hygiene, and the Department of Pediatrics, Western Reserve University, Cleveland.

1. Gerstenberger, H. J.; Haskins, H. D.; McGregor, H. H., and Ruh, H. O.; Studies in the Adaptation of an Artificial Food to Human Milk, AM. J. DIS. CHILD., **10**:249, 1915.

2. Holt, L. E.: Diseases of Infancy and Childhood, New York, D. Appleton and Co., 1911, p. 186.

month to be from 2.83 to 4.37 per cent.; (*b*) that whenever the fat is increased in the artificial food the protein is likewise increased and gradually to nearly the same total amount, while in human milk there is always, after the second week, a decided difference in the percentage content of the fat and protein, the latter always being decidedly lower.

Schloss' milk might seem to be an exception to the foregoing statement, as his milk contains a low protein and a high fat content.

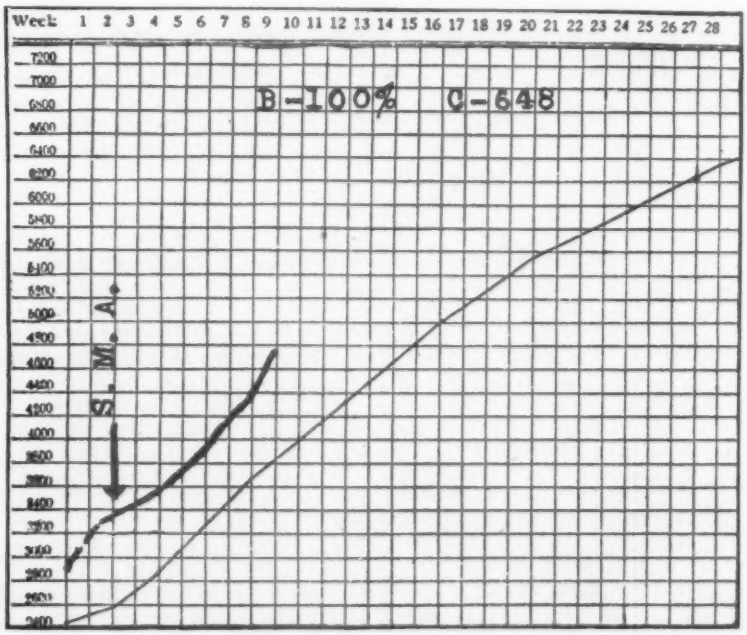


Chart 1.—Baby admitted to dispensary, April 8, 1918, at the age of 11 days, weighing 3,320 gm. Breast fed for nine days, artificially two days, when it was given S. M. A., 7x70 c.c., until the seventh week when it was increased to 7x90. The response of the child to the food has been excellent as can be seen from the chart. The total gain for the seven weeks being 1,420 gm., or an average weekly gain of 202 gm.

Explanation of weight charts: In all the charts in this paper the following symbols apply:

A-100% = Under observation at dispensary while getting other food before receiving 100 per cent. S. M. A.

B-100% = Receivtd 100 per cent. S. M. A. on admission to dispensary.

C = Central Dispensary.

Roman figures = No. of Prophylactic Dispensary.

Arabic figures = Serial number.

The broken lines in these charts indicate weight before admission to dispensary; solid lines indicate weight during feeding with S. M. A.; dotted lines indicate weight from the time of admission of the infant to feeding with S. M. A.

However, his milk is different, inasmuch as he adds no lactose to it. He employs from 35 to 50 gm. of a mixture of dextrin and maltose and in some instances even adds cornstarch flour. He did this because he found that the children fed with his mixture containing only lactose in the presence of low protein and high fat had dyspeptic stools and did not do well. This condition improved as soon as he replaced the

lactose with other sugars. We have been able to get the same non-dyspeptic stool in the presence of the high lactose percentage when we replace the cow's milk fat with S. M. A. fat.

2. Breast milk fat and cow's milk fat vary considerably in their saponification, iodin, Polenske and Reichert-Meissl numbers. The last named number designates the amount of volatile fatty acids present in the fat. Breast milk fat contains about 1.6 per cent., whereas

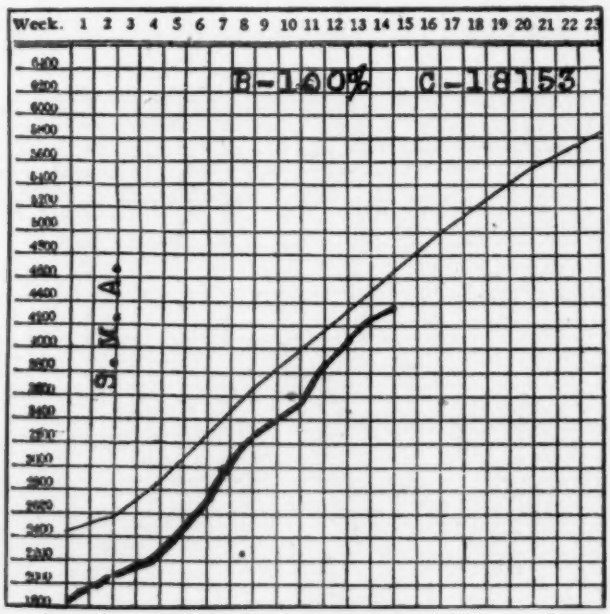


Chart 2.—Premature baby, weighing 4 lbs., 11 oz. at birth. Artificially fed. Came to the dispensary, May 6, 1918, at the age of 2 weeks, weighing 2,040 gm. and was given 10x30 c.c. S. M. A., which after two days was increased to 10x40 and ½ dram orange juice. The weight increased 40 gm. in five days and the food was increased to 10x45. The following week brought a gain of 180 gm. and the food was changed to 8x70. In another week the weight had reached 2,715, representing a weekly gain of 265 gm. This represents an excellent result in a young premature infant coming to the dispensary. Since then the baby has continued this excellent result, making in eight weeks a total gain of 1,665 gm., which equals 208 gm. per week.

cow's milk fat contains 10 per cent. These volatile fatty acids are considered by authors, such as Bokai,[3] Bahrdt,[4] and Czerny,[5] to play an important part in the production of not only the chronic but also the acute nutritional disturbances of infants.

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3. Bokai, A.: Experimentelle Beiträge zur Kenntniss der Darmbewegungen. C. Ueber die Wirkung einiger Bestandteile der Fäces auf die Darmbewegungen, Arch. f. exper. Path. u. Pharmakol., **24**:153, 188.

4. Bahrdt, H., and McLean, Stafford: Untersuchungen ueber die Pathogenese der Verdauungsstörungen im Säuglingsalter; VIII. Mitteilung, Ztschr. f. Kinderh., Orig., **11**:143, 1914.

5. Czerny-Keller: Des Kindes Ernährung Ernährungsstörungen und Ernährungstherapie, Sec. 7, p. 137, Franz Deuticke, Wien, 1909.

3. Breast milk contains a high percentage of fat. Artificial milk formulas contain decidedly less, except when the infants have nearly finished the more difficult first half-year. This high fat content in human milk is unquestionably present for a good reason. Czerny long ago expressed the belief that a food high in fats raises the immunity of the child, and that one low in fats and high in carbohydrates reduces it.

4. The practical results with our present artificial food mixtures, whether they be simple dilutions or percentage mixtures, are far from

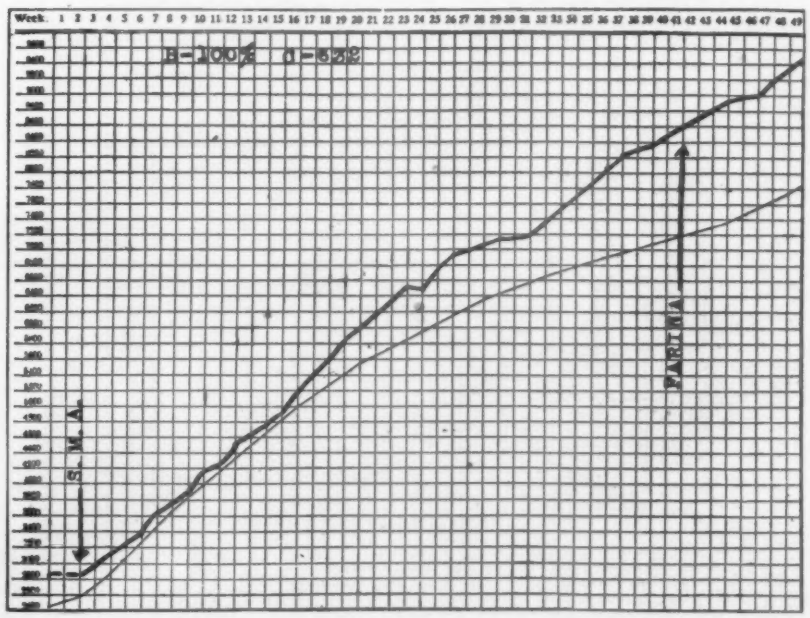



Chart 3.—Birth weight 5½ lbs. Breast fed for one week then put on one-half milk and one-half water. Entered the dispensary, Jan. 26, 1916, at the age of 2 weeks, weighing 2,820 gm. It was given 7x90 S.M.A. and gained 90 gm. during the first week and 250 gm. during the second week. It continued to make a very satisfactory gain in weight as the chart shows. This result of feeding with S.M.A. is excellent.

satisfactory in institutional infants and among the poor and middle classes. Especially is this true if the infants are 1 month old or less. One can usually pick out from a group of dispensary patients the breast fed from the bottle fed and in an institution this can be done practically without an exception. There are, however, some infants who do well under the worst conditions and on most any kind of food; but they are exceptionally resistant little human beings and by no means speak for the innocuousness of the food that they have received or the environment in which they live.

5. The adaptation of the fat in artificial infant foods to that of human milk might represent the correction of the one factor whose neglect heretofore, even in the face of other adaptations along different lines, has been responsible for the failure to reach the goal that has been sought for the past three decades, namely, the preparation of an artificial food that will simulate human milk in sufficient essentials to make possible two things: (*a*) the preparation of one formula which would be usable with good nutritional results, without dilution or any other change, except in quantity, in possibly 90 per cent. of the infants

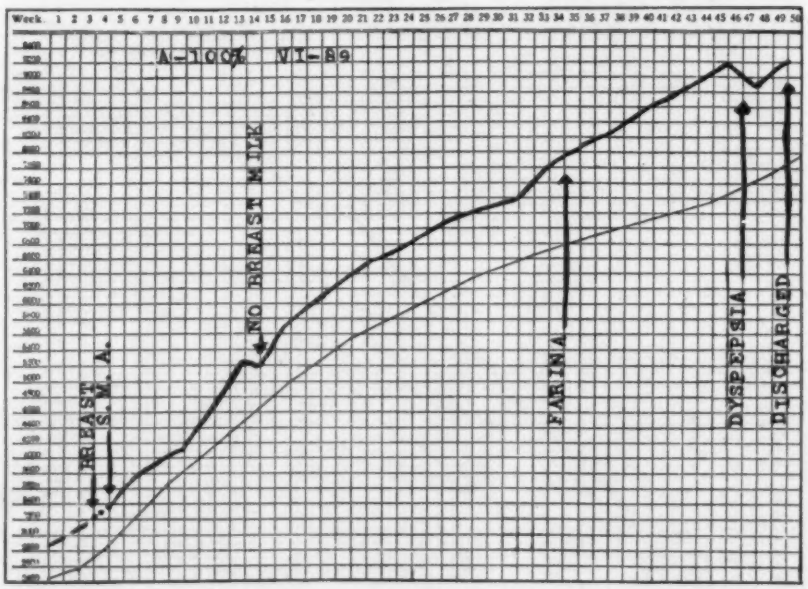



Chart 4.—Birth weight supposed to have been 7¼ lbs. Breast-fed. Admitted to dispensary on Jan. 19, 1917, 3 weeks of age, weighing 3,250 gm. During ten days the infant gained 120 gm. at the breast. As the child seemed hungry, 7x60 S.M.A. was ordered at each nursing. This resulted in a gain of 490 gm. in two weeks and 210 gm. in another two weeks. With the fourteenth week the mother's milk had entirely disappeared and the child was fed entirely with S.M.A. Orange juice was given beginning with the ninth week. With the thirty-third week farina soup was added to the diet. The weight curve continued at the same angle until the forty-sixth week when the child developed a dyspepsia. After recovering from this dyspepsia it was placed on plain milk and did well. This case represents an excellent result of the feeding with S.M.A.

who cannot for some valid reason have the advantage of human milk; and (*b*) the simplification of infant feeding, at least for the biggest percentage of infants, so that the general practitioner could feed many more infants with good results than he now can, and in this manner contribute much toward the preservation of the health and strength of the nation and mankind.

While we speak in the foregoing about the preparation of only one formula for both young and old infants during the first year, we

are cognizant of the fact that during the first two weeks at least the infant is getting a chemical mixture that is distinctly different from the so-called mature milk, especially in its relatively high protein and in its somewhat reduced fat content. For infants of this age there should be prepared another mixture that would take into account the needs during the first two weeks of life. The number of infants, however, that require artificial food immediately after birth is very small, so that such a mixture will be rather rarely called for. How-

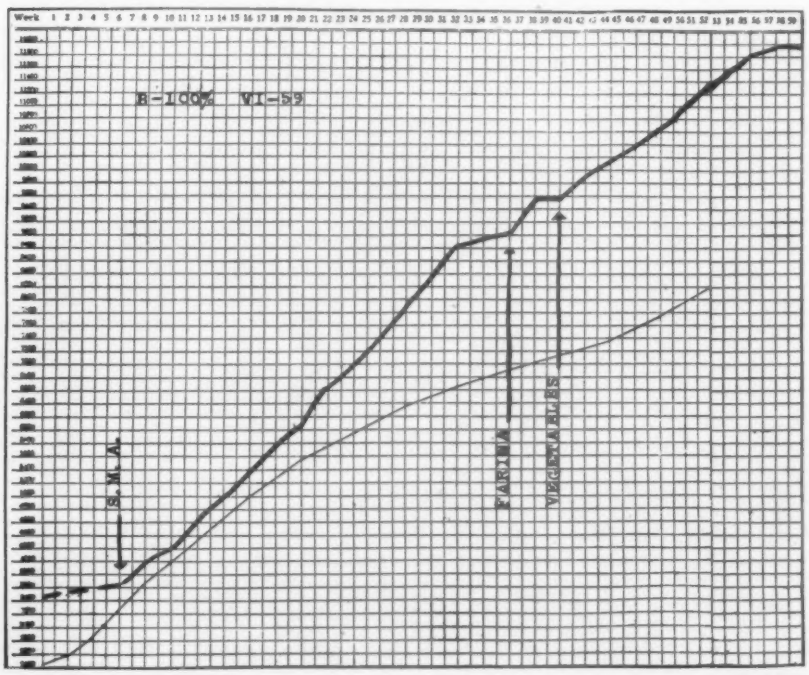



Chart 5.—Nursed for one month, then fed malted milk for two weeks and milk dilutions for three weeks. Entered dispensary at 9 weeks, weighing 3,650 gm. Given S.M.A. 7x100, it immediately responded with a decided increase in weight and continued to do so. With the thirty-sixth week farina soup was added to the diet, and from the fortieth to forty-first weeks small amounts of vegetables. This represents an excellent result.

ever, theoretically speaking, one should have at one's disposal two formulas; one for the first two weeks of life and the other for the rest of the year. There are, of course, changes that occur in the chemical composition of the breast milk from the second to the fourth week and from the first to the tenth month, and again from the tenth until the eighteenth month,[6] but these changes are not very decided after the first month, and then, too, the infant has become older and more

6. Holt, Courtney, and Fales: A Chemical Study of Woman's Milk, Especially Its Inorganic Constituents, Am. J. Dis. Child., **10**:229, 1915.

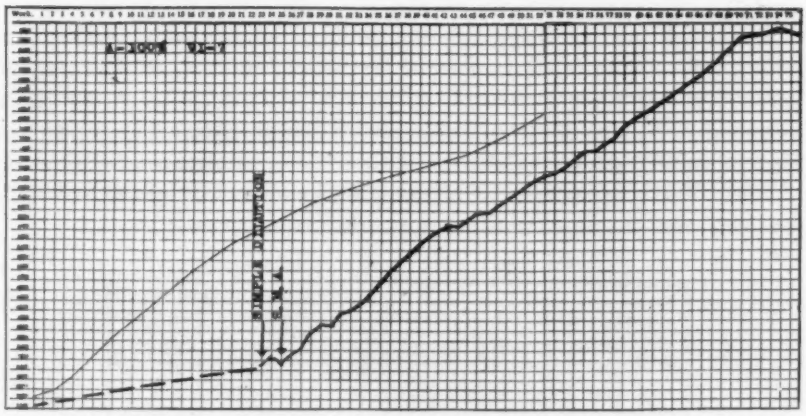



Chart 6.—Breast fed for one month, then Horlick's Malted Milk for five weeks, then simple dilutions. At the age of 25 weeks it weighed 3,170 gm., having gained 850 gm. during the first five and one-half months of its life. It was then placed on S.M.A. VIII plus orange juice, and made a remarkable record, having gained during the thirty-seven weeks of observation 5,000 gm., or 137 gm. per week, or 19.26 gm. per day. The stools were normal throughout the entire time of observation. Occasionally a slight dryness was reported. No vomiting. This child was one of twins. An excellent result.

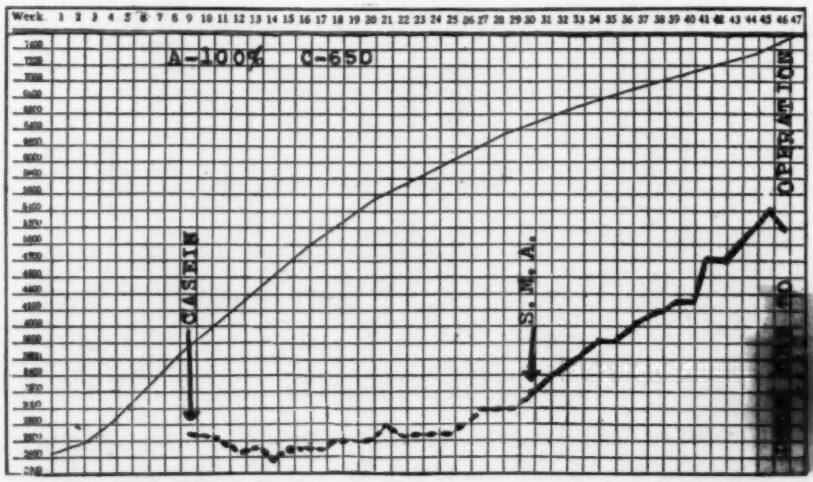



Chart 7.—Baby born with hare-lip and cleft palate. Nothing known about birth weight and feeding before coming to Lakeside Hospital. Entered Lakeside Hospital at the age of 9 weeks, weighing 2,700 gm. Was given casein milk with an adequate quantity of carbohydrate and orange juice. At the 29th week it weighed 3,000 gm., a total gain of 300 gm. for twenty weeks. At that time it was fed S.M.A. and immediately began to gain, reaching a weight of 5,400 gm. in the 45th week. In other words, the child during this time showed a gain of 2,400 gm., or an average weekly gain of 150 gm. The drop at the end of the curve is due to the reduced feeding in consequence of an operation. The picture and general disposition of this child improved just as decidedly as the weight chart. An excellent result.

resistant and so can nourish himself with less risk than he can immediately after birth. We have not produced as yet such a colostrum milk on a careful and fine basis. We have, however, in the case of certain premature infants made a mixture of half S. M. A. and half skimmed milk, and so have decreased the fat content and increased the protein and salt content. These cases, however, are not included in this report. We simply wish to mention that in the few cases in which we have tried out this combination it has been successful.

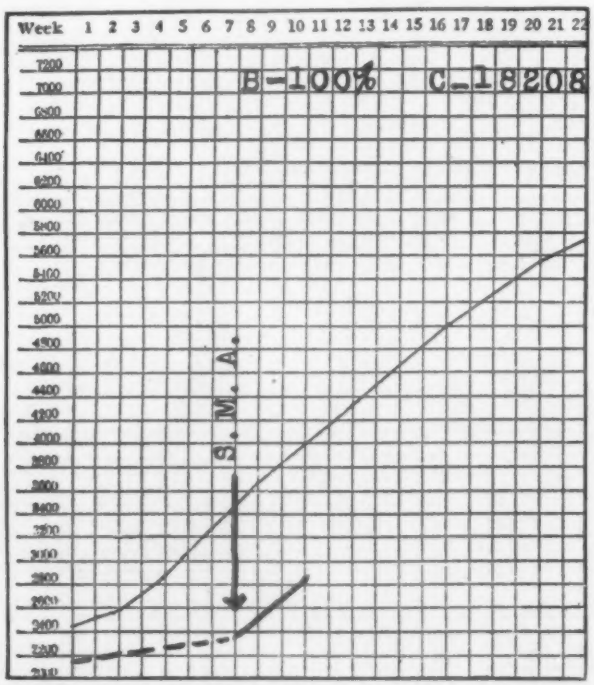



Chart 8.—Premature baby, admitted to the dispensary, May 15, 1918, weighing 2,180 gm. Birth weight supposed to have been 4 lbs., 14 oz. Was given 10x30 S.M.A., and placed in a premature jacket. After three days, weight chart remained the same. S.M.A. increased to 10x45 with resulting increase in weight of 140 gm. in four days. Schedule changed to S.M.A. and 1 dram orange juice. After one week the weight increased 160 gm. and in another week 190 gm. At this time the orange juice was increased to 2 drams. Chart shows only one observation, but is good illustration of excellent results obtained in a very small baby.

In the first publication it was clearly stated that the adaptation of an artificial fat to human breast milk fat would have to take into consideration, among other things, the fat soluble growth factor of the mixture, and that such a milk as a whole could not, then, represent a finished product, even from the standpoint of our present knowledge of the chemistry, physics, bacteriology and biology of human milk, not to speak of possible and probable future discoveries along these and other lines.

The anticipation of such a development was the main reason why the personal name of "G-R" was first given this new fat adapted preparation, in place of the special one that logically might have been used, "fat adapted milk." Since then it has been realized that the general, broad comprehension of the problem could be retained without attaching the personal element to it, and so the designation "G-R" was replaced by "S. M. A." (Synthetic Milk Adapted).

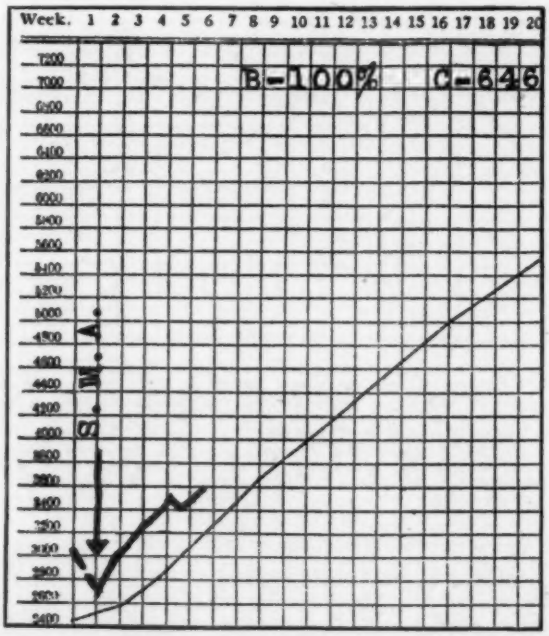



Chart 9.—First child. Birth weight supposed to have been 7½ lbs. Mixed feeding from the first day. Entered the dispensary, Feb. 6, 1918, at the age of 1 week and weighing 2,650 gm. The breast of the mother was found to be practically dry, but she was urged, however, to try to nurse the baby and give it 10x30 S. M. A. besides. In one week the weight had increased 340 gm., and in another week an additional 270 gm. At this time the mother's breast was absolutely dry. One-half dram orange juice was given five times in twenty-four hours. Child made regular gains, and at the age of 5 weeks weighed 3,520 gm., having made during four weeks a gain of 870 gm., or a weekly gain of 217.5 gm. The family moved to another city at this time. This result is considered excellent.

The main object of the first report was twofold: (1) to present the idea of fat adaptation, and (2) to show that the replacing of the butter fat in Friedenthal's mixture with a fat with the low volatile fatty acid content of breast milk fat would change the dyspeptic character of the stools. This was adequately proved in 1915 by the twenty cases reported then. So when, at the time of the presentation of the first report, the interesting and valuable work of Holt, Courtney and Fales[6] appeared, the new data contained therein was used as

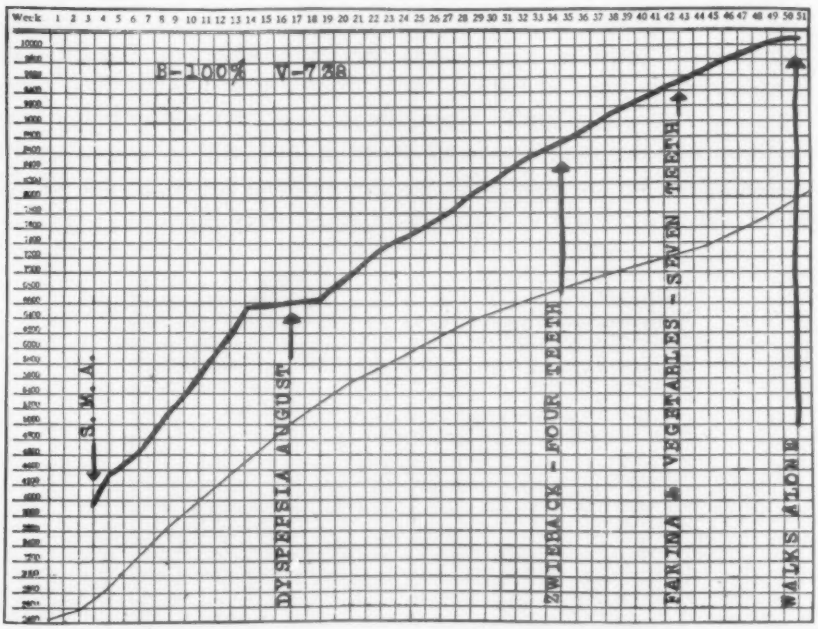



Chart 10.—Baby has been artificially fed since birth—Mellin's Food and Eagle Brand Condensed Milk. Admitted to the dispensary, April 20, 1917, at the age of 4 weeks, and weighing 3,910 gm. It was given 6x120 S.M.A. and in 1 week made a gain of 400 gms. This remarkable increase in weight continued until the fourteenth week, when the baby had a dyspepsia during the month of August. As a result, the weight curve was nearly stationary for a month, but then again resumed a normal rise until the end of the year, at which time the child could walk alone. With the thirty-fifth week it had four teeth, and with the forty-third it had seven. The result of feeding with S. M. A. in this case may be considered excellent.

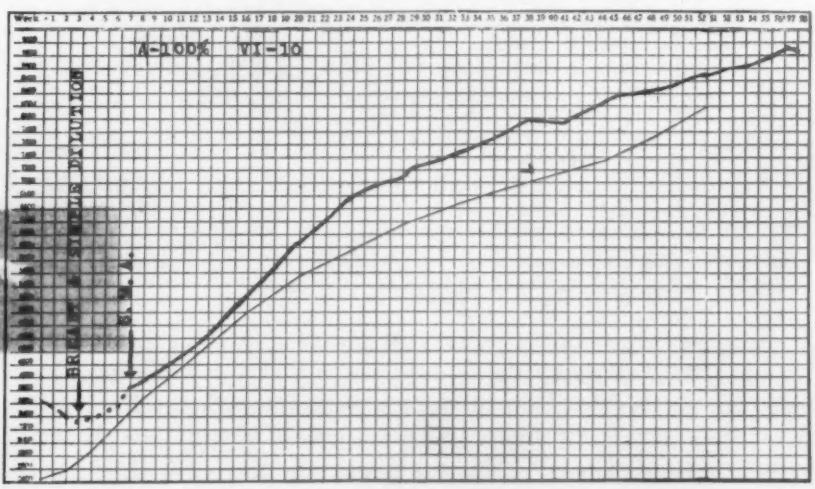



Chart 11.—Breast-fed for two weeks, but quantity insufficient; therefore, alternated breast with milk dilution. Stools were thin and dyspeptic. Placed on S. M. A. at the age of 7 weeks, weighing 3,860 gm. At the age of 1 year it weighed 8,700 gm., having gained 4,840 gm., or 107 gm. per week. At the fifty-ninth week it weighed 9,075 gm., having gained 5,215 gm., or 100 gm. per week. An excellent result.

a basis for the fat and sugar percentage, especially as the findings of these authors corroborated Friedenthal's[7] theoretical ideas regarding the chemical composition of breast milk, and also as they corresponded with Schloss'[8] most recent determinations of the protein and fat content of breast milk.

The chemical formula which we then set as our goal was the following: Protein, 1.2 per cent.; fat, 3.5 per cent.; sugar, 7.5 per cent., ash, 0.2 + per cent. The physical standards were not changed from those of Friedenthal,[7] as described in our first publication.[1]

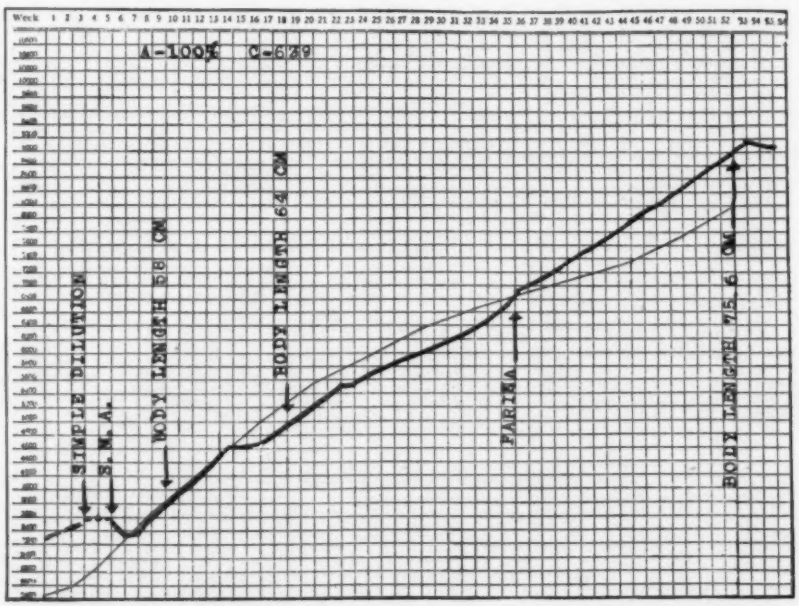



Chart 12.—Breast-fed for two weeks. Then artificially fed. Entered the dispensary, July 24, 1916, at the age of 3 weeks, weighing 3,520 gm. and ill with a dyspepsia. He was sent to the outdoor ward, where he remained three weeks, returning to the dispensary with a weight of 3,370 gm. He had been given S. M. A. at the outdoor ward, and this was continued at the dispensary. Child responded with a marked rise in the weight curve and continued to do so until the end of the year, at which time the hemoglobin content was from 80 to 70 per cent., white cell count 13,200 and red cell count 5,616,000. The head circumference was 45 cm., girth 42 cm., chest 46 cm., length 75⅔ cm. The result in this child was excellent.

## PREPARATION OF THE FOOD

As we have used in the preparation of this food fresh, certified skimmed milk as the basis, and as we have not found it possible to make daily analysis of the skimmed milk as to its fat, protein, carbohydrate and ash content, we chose an amount of skimmed milk and quantities of sugar and fat that would absolutely assure us of getting a minimum percentage of 1.2 protein, 3.5 fat and 7.0 sugar. Of these

7. Friedenthal: Zentralbl. f. Physiol., **24**:687, 1910.
8. Schloss, E.: Monatschr. f. Kinderh., **10**:499, 1912.

constituents, of course the protein factor is really the only one that is of great importance, when considered from the standpoint of minimum requirement, as it is much closer to the actual minimum than either the fat or carbohydrate.

In the different analyses of skimmed milk which have been made by us we have occasionally met with as low a protein content as 3.2, a sugar content of 4.0 and a fat content of 0.1, so that we used these figures as the basis for our requirements to be sure to give us the minimum percentages decided on, namely, 1.2 protein, 7.0 sugar, 3.5 fat, and 0.2 ash.

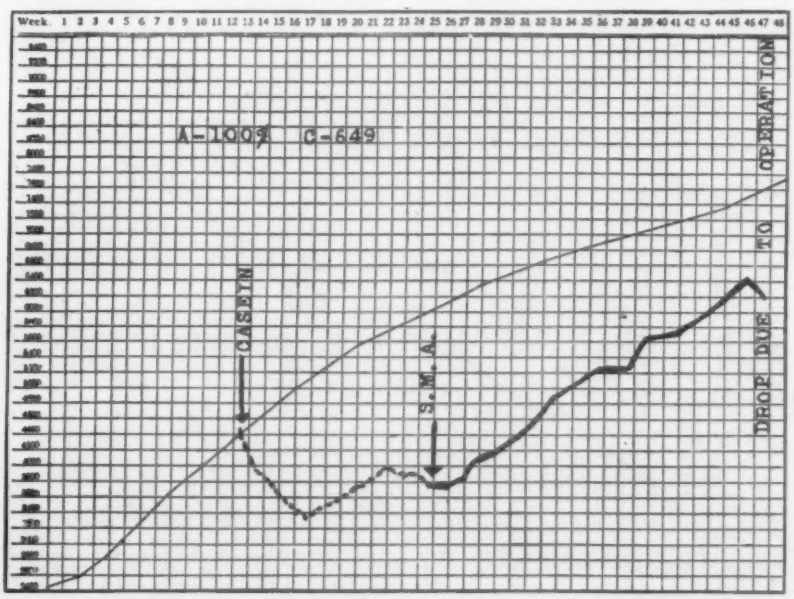



Chart 13.—Baby born with harelip and cleft palate. Artificially fed from birth. Birth weight unknown. Entered Lakeside Hospital during thirteenth week of its life weighing 4,500 gm., and was put on casein milk with orange juice and an adequate amount of carbohydrate. The result was poor, even though the child was fed with this food until the twenty-fifth week. At that time his weight was 3,780 gm.—720 gm. less than his entry weight. He was then placed on S. M. A. and immediately began to gain, reaching a weight of 6,400 gm. in his forty-sixth week. The drop at the end of the chart is due to the lessened intake of food as the result of an operation. The weight chart also pictures well the improvement in the general appearance and disposition of the child. An excellent result.

If the skimmed milk should contain higher values, as found in another analysis at a different time, namely, protein, 3.59; sugar, 4.87; fat, 0.5, then by the use of same amounts of skimmed milk, sugar and fat we should get a protein content of 1.34, a fat content of from 3.68 to 3.7, and a sugar content of 7.5.

Potassium chlorid was added in the amount used by Schloss, namely, 0.2 per 1,000 gm. This addition was, in all probability, not necessary, yet it was made as the relative amount of potassium is smaller in cow's

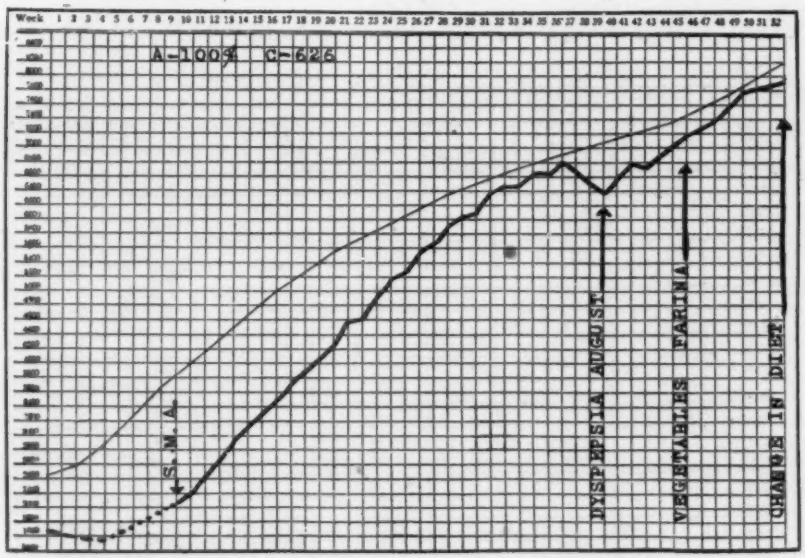



Chart 14.—Premature baby weighing 4 lbs. at birth. Entered dispensary, Dec. 20, 1915, at the age of 1 month, and weighing 1,520 gm. It was given, besides the breast, 10x50 of one-third milk, and in one week gained 230 gm., and in another week an additional 110, and in a further two weeks 200 gm. At this time it was given 6x90 S.M.A. and responded with a gain of 220 gm. for the first week and a gain of 450 gm. for the following two weeks. This remarkable gain continued until August, when the child developed a dyspepsia. After its recovery the weight curve again resumed an upward trend until it was changed to a whole milk diet at the age of 52 weeks. This is an excellent result, but evidently this child was not difficult to feed, inasmuch as it made a very satisfactory gain on the mixture of breast and one-third milk, which is a rare occurrence, especially when one considers its very low weight at the beginning.

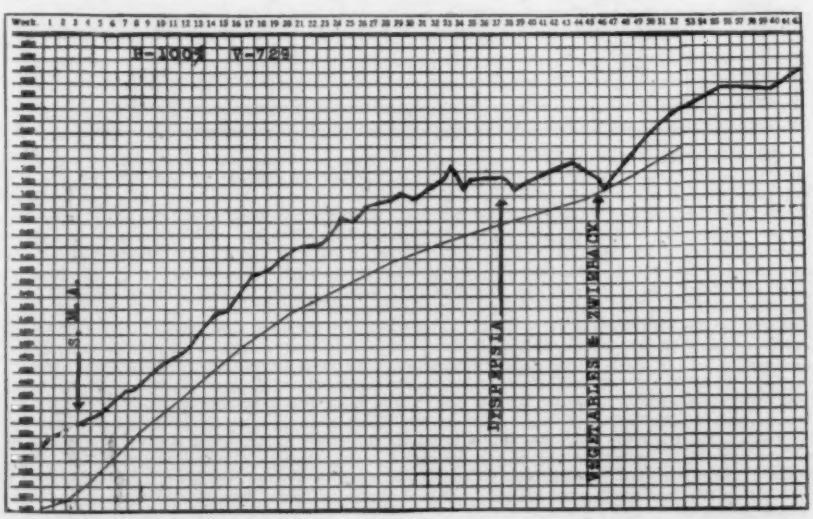



Chart 15.—Fed with S. M. A. since third week of life. During the eighth week of feeding a bronchitis developed. During the nineteenth and twenty-second weeks there was a loss of weight as a result of acute rhinitis and following a vaccination. During August a dyspepsia developed which resulted in a stationary weight for a number of months. On the addition of vegetables and zwieback to the diet of S. M. A. the child again gained weight. The development for the first thirty weeks was excellent. This record, however, was marred by the twelve weeks of stationary weight. Whether this was due simply to the dyspepsia or to a partial inadequacy of the diet which was remedied by the vegetables and zwieback, it is difficult to say. A good result.

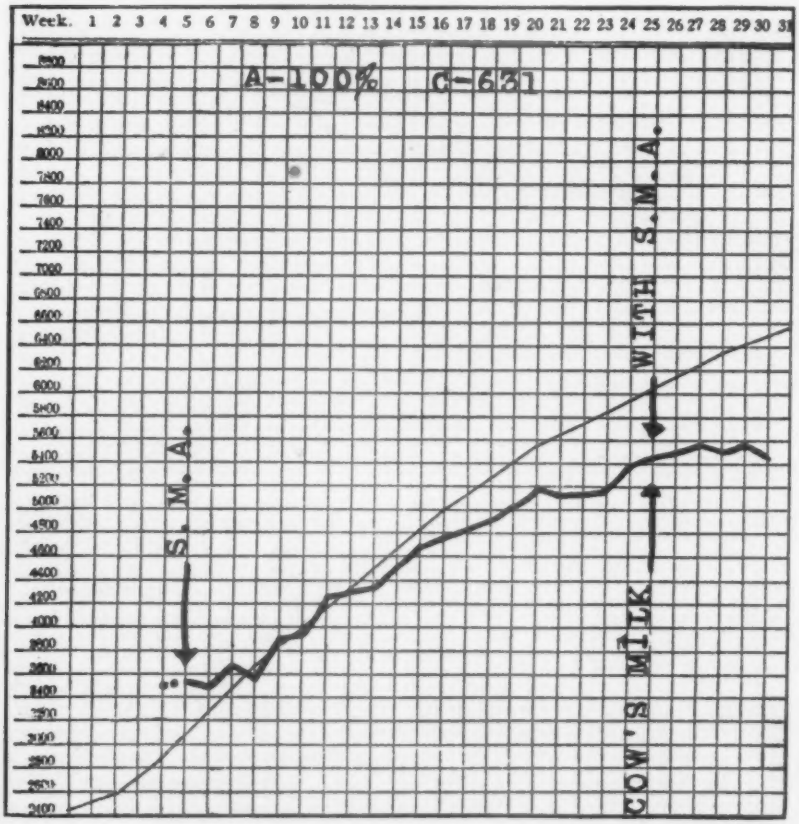



Chart 16.—Mother died of pneumonia when baby was 3 weeks old. Breast-fed for a week, then fed with certified milk. Brought to the dispensary on account of sore mouth, Jan. 13, 1916, at the age of 1 month, weighing 3,420 gm. Was first given one-half milk and one-half water, which brought a weekly gain of 40 gm. It was then given 6x100 S. M. A. and lost 20 gm. during the first week, but gained 170 during the following. During the third week it again dropped below its former gain, only, however, to rise again with an increase in the amount of S. M. A. During this time it had gained in length from 51 cm. to 56 cm.; that is, in seven weeks. After the twelfth week the weight curve angle became more acute, and from the twenty-fifth to the thirtieth week remained practically stationary. It was later learned that during this month, besides S. M. A., it was also fed ordinary cow's milk. It is a question, however, whether the orange which had been urged had been given, as the grandmother, who was caring for the child, did not seem to appreciate the need for proper care. It was therefore removed from S. M. A. and given a mixture of one-half milk and one-half oatmeal water with five teaspoonfuls of sugar, 6x150. Within a week the baby had a diarrhea and fever. It was sent to the hospital, from which it was discharged two weeks later with a diagnosis of enteritis follicularis. This poor result is due to the effect of ignorance and poor cooperation on the part of the grandmother in the giving of orange juice. That the fat could have had nothing to do with the development of the weight chart is proved beyond a doubt by the fact that the infant was given one-half milk mixture for four weeks without any beneficial effects. A fair result.

# TABLE 16—DATA OF INDIVIDUAL CASES

| Serial No. | Weight in Gm. and Age on Admission | Feeding (a) Previous to Admission (b) Between Admission to Disp. and S.M.A. Beginning | Physical Findings on Admission (Including Bact. or Nutr. Diseases Previous to Admission) | Time Between Adm. Date and S.M.A. Beginning | Average Weekly Gain or Loss (—) in Weight at Dispensary Previous to S.M.A. Beginning, Gm. | Bacteriologic or Nutritional Diseases Observed at Dispensary Previous to S.M.A. Beginning | Weight in Gm. and Age at S.M.A. Beginning | Physical Examination at S.M.A. Beginning | S.M.A. per Cent. | Number Weeks on S.M.A. | Average Wkly. Gain or Loss (—) in Weight While on S.M.A., Gm. | Bacteriologic or Nutritional Diseases Observed at Dispensary During Feeding with S.M.A. | Bowels on S.M.A. Normal, per Cent. | Bowels on S.M.A. Constipated, per Cent. | Bowels on S.M.A. Dyspeptic, per Cent. | Vomiting During S.M.A. | Gain in Length while on S.M.A. (Age in Weeks) Wks. Cm. | Net Result of Feeding with S.M.A. | Why Removed from S.M.A. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 3,600 6 wks. | (a) Breast 6 wks. ..... (b) S.M.A. on admission | Negative..... | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,600 6 wks. | Same as on admission | 100 | 19 | 69.4 | Vomiting 1 time | 100 | .. | .. | Slight; rare | ..... | II | Standstill in weight too persistent |
| 3 | 4,650 10 wks. | (a) Br. 7 wks.; simple dil. 3 wks. (b) S.M.A. on admission | Sl. exudative; few scales on scalp and back of left ear. Turgor fair | 0 | S.M.A. on adm. | S.M.A. on adm. | 4,650 10 wks. | Same as on admission | 100 | 9 | 101.1 | Constipated; some dyspepsia | 60 | 25 | 15 | Slight; rare | ..... | I | Moved |
| 4 | 3,120 4 wks. | (a) Br.1 wk.; br. + simple dil. 3 wks. (b) Same for 1 wk. | Thrush; general condition fair | 1 wk. | —70.0 | Negative | 3,050 5 wks. | Negative | 100 | 10 | 100.0 | Negative | 10 | 90 | .. | Slight; rare | ..... | I | Moved |
| 6 | 3,900 8 wks. | (a) Br. 6 wks.; simple dil. 2 wks. (b) Simple dil., then straight milk 39 wks. | Negative..... | 47 wks. | 68.9 | Dyspepsia 3 times | 7,140 55 wks. | Sl. exud.; sl. rickets; skin pale | 100 | 13 | 91.5 | Neg. except coryza | 100 | .. | .. | Negative | ..... | I | Age |
| 7 | 3,100 23 wks. | (a) Br. 4 wks.; Horlick's 5 wks.; simple dil. 14 wks. (b) Cert. milk M. 2 wks. | Underfed..... | 2 wks. | 35.0 | Dyspepsia | 3,170 25 wks. | Dyspepsia | 100 | 53 | 123.9 | Bronchitis, eczema, rhinitis | 80 | 10 | 10 | Slight; rare | 14 61.0 18 62.5 22 66.5 41 70.25 | I | Age |
| 8 | 2,820 6 wks. | (a) Br. + top milk 1 wk.; skimmed milk 6 wks. (b) S.M.A. on admission | Disturbed balance..... | 0 | S.M.A. on adm. | S.M.A. on adm. | 2,820 6 wks. | Same as on admission | 100 | 8 | 122.5 | Sl. dyspepsia | 50 | 10 | 40 | Slight; freq. | ..... | II | Moved |
| 9 | 2,300 3 wks. | (a) Cert. milk, simple dil. 3 wks. (b) S.M.A. on admission | Poor; flabby baby; constipated. Vomiting | 0 | S.M.A. on adm. | S.M.A. on adm. | 2,300 3 wks. | Same as on admission | 100 | 6 | 130.0 | Dyspepsia | 35 | 15 | 50 | Medium; freq. | ..... | II | Private Dr. advised against |
| 10 | 3,340 3 wks. | (a) Br. 2 wks.; br. + mod. 1 wk. (b) Br. + cert. milk M. 4 wks. | Glossitis; umbilical hernia... | 4 wks. | 130.0 | Negative | 3,860 7 wks. | Negative | 100 | 53 | 97.7 | Sl. exudative | 70 | 20 | 10 | Slight; rare | 6 57.0 15 62.5 27 67.5 40 69.0 55 74.5 | I | Age |
| 11 | 4,290 5 wks. | (a) Br. 4½ wks.; Horlick's 3 days (b) Br. + cert. milk M. 16 wk. | Negative..... | 16 wks. | 105.0 | Negative | 5,970 21 wks. | Negative | 100 | 30 | 121.0 | Negative | 100 | .. | .. | Medium; freq. | 51 71.5 | II | Age |
| 12 | 2,810 19 days | (a) Br. + simple dil. 19 days..... (b) Br. 4 days; cert. milk M. 3 days | Blue baby; cyanotic over entire body | 1 wk. | —140.0 | Negative | 2,670 26 days | Negative | 100 | 7 | 34.2 | Constipated | 20 | 80 | .. | Negative | 6 52.5 | I | Parents indifferent |
| 13 | 3,900 9 wks. | (a) Mod. milk 9 wks. ..... (b) Same 5 days | Excoriated buttocks..... | 5 days | 100.0 | Exoriated buttocks | 4,010 10 wks. | Intertrigo; eczema on thighs and buttocks | 100 | 9 | 86.6 | Exudative | 80 | 10 | 10 | Slight; freq. | 17 61.5 | III | Private Dr. advised against |
| 15 | 4,040 6 wks. | (a) Br. 3 wks.; mixed 2 wks.; Eskay's + cream 1 wk. (b) S.M.A. on admission | Good; Sl. beading of ribs; Sl. scales behind ears; Sl. rhinitis | 0 | S.M.A. on adm. | S.M.A. on adm. | 4,040 6 wks. | Same as on admission | 100 | 34 | 90.0 | Ac. otit. media; bronchitis; pneumonia; sl. eczema; convulsions (1); dyspepsia | 90 | .. | 10 | Slight; rare | 10½ 57.25 20 63.5 | II | Nervous; did not do well |
| 16 | 4,780 24 wks. | (a) Breast 24 wks. ..... (b) Br. + cert. milk M. 14 wks.; cert. milk M. 12 wks. | Turgor poor..... | 26 wks. | 76.5 | Pneumonia; constipation | 6,770 50 wks. | Good | 100 | 7 | 90.0 | Sl. dyspepsia | 50 | 25 | 25 | Negative | ..... | IV | Age |
| 17 | 3,100 4 wks. | (a) Br. + Horlick's 4 wks. ..... (b) Br. + Horlick's 1 wk. | Thrush..... | 1 wk. | 210.0 | Thrush; exudative | 3,310 5 wks. | Exudative | 100 | 43 | 100.0 | Rhinitis; vaginitis; intertrigo; coryza; scales on head | 90 | .. | 10 | Negative | 5 52.0 17 60.5 21 62.0 | I | Private Dr. advised against |
| 19 | 3,680 8 wks. | (a) Br. 1 mo.; br. + milk mod. 1 mo. (b) Br. + cert. milk M. 4 wks.; cert. milk M. 19 wks. | Fair..... | 23 wks. | 163.4 | Dyspepsia; otitis media | 7,440 31 wks. | Negative except no teeth | 100 | 6 | 51.6 | Dyspepsia | 70 | .. | 30 | Negative | ..... | III | Private Dr. advised against |
| 20 | 4,840 19 wks. | (a) Br. 8 wks.; Mellin's Food 11 wks. (b) Cert. milk M. 22 wks. | Muscles flabby..... | 22 wks. | 138.6 | Slight vomiting; dyspepsia | 7,890 41 wks. | Negative | 100 | 24 | 152.5 | Negative | 100 | .. | .. | Negative | ..... | I | Age |
| 21 | 3,560 11 wks. | (a) Breast 11 wks. ..... (b) Br. + cert. milk M. 22 wks. | Club foot; undernourished.. | 22 wks. | 72.7 | Constipated; slight dyspepsia | 5,160 33 wks. (with casts on feet) | Negative except feet | 100 | 18 | 218.8 | Negative | 100 | .. | .. | Negative | ..... | I | Age |
| 22 | 3,240 7 wks. | (a) Breast 7 wks. ..... (b) Br. + cert. milk M. 30 wks. | Negative..... | 30 wks. | 122.3 | Eczema; exudative | 6,910 37 wks. | Slight dyspepsia | 100 | 6 | 210.0 | Negative | 100 | .. | .. | Negative | ..... | I | Moved |
| 24 | 3,280 5 wks. | (a) Breast 5 wks. ..... (b) Br. 10 wks.; br. + oatmeal water 1 wk. | Negative..... | 11 wks. | 107.2 | Slight dyspepsia | 4,400 16 wks. | Regurgitates at times | 75 25 Br. | 32 | 80.9 | Dyspepsia | 50 | 30 | 20 | Slight; rare | ..... | II | Lack of appetite |
| 25 | 3,290 7 wks. | (a) Breast 7 wks. ..... (b) Br. + cert. milk M. 14 wks. | Turgor poor..... | 14 wks. | 148.5 | Negative | 5,370 21 wks. | Turgor fair | 75 25 Br. | 11 | 110.9 | Improved | 100 | .. | .. | Negative | ..... | I | Moved |
| 26 | 4,320 9 wks. | (a) Br. 2 wks.; cert. milk M. 7 wks. (b) Cert. milk M. 12 wks. | Negative..... | 12 wks. | 127.5 | Buttocks excoriated; constipated | 5,850 21 wks. | Sl. exud.; pale skin; beading of chest suggestive; also at ankles and wrists | 100 | 27 | 76.2 | Dyspepsia | 100 | .. | .. | Negative | ..... | I | Age |
| 27 | 2,310 3 wks. | (a) Breast 3 wks. ..... (b) Br. + cert. milk M. 12 wks. | Negative (twin)..... | 12 wks. | 131.6 | Dyspepsia | 3,890 15 wks. | Slight rickets | 75 25 Br. | 39 | 130.2 | Negative | 100 | .. | .. | Negative | ..... | I | Age |
| 28 | 2,350 3 wks. | (a) Breast 3 wks. ..... (b) Br. + cert. milk M. 12 wks. | Negative (twin)..... | 12 wks. | 134.1 | Dyspepsia | 3,840 15 wks. | Slight rickets | 75 25 Br. | 39 | 128.4 | Negative | 100 | .. | .. | Negative | ..... | I | Age |
| 31 | 4,920 11 wks. | (a) Breast 11 wks. ..... (b) Breast 22 wks. | Good; Sl. rash on face..... | 22 wks. | 101.3 | Vomiting | 7,150 33 wks. | Negative (5 teeth) | 50 50 Br. | 7 | 107.1 | Constipated | 10 | 90 | .. | Negative | ..... | I | Moved |
| 33 | 4,520 5 wks. | (a) Breast 5 wks. ..... (b) Br. + cert. milk M. 10 wks. | Umbilical hernia..... | 10 wks. | 21.0 | Negative | 4,730 15 wks. | Negative | 75 25 Br. | 32 | 81.5 | Sl. vomiting because of rapid swallowing | 100 | .. | .. | Negative | 33 64.5 | I | Age |
| 34 | 5,690 25 wks. | (a) Breast 25 wks. ..... (b) Br. 1 wk.; Br. + cert. 10 wks. | Negative..... | 11 wks. | 87.2 | Slight dyspepsia; constipated | 6,650 36 wks. | Vomiting; constip. | 75 25 Br. | 21 | 85.7 | Negative | 100 | .. | .. | Negative | 51 71.0 | I | Age |
| 35 | 5,270 12 wks. | (a) Br. + milk 1 oz., cream 8oz., water 12 oz. (b) Br. + cert. milk M. 8 wks. | Negative..... | 8 wks. | 248.7 | Negative | 7,200 20 wks. | Good | 50 50 Br. | 12 | 192.5 | Negative | 100 | .. | .. | Negative | ..... | I | Dyspepsia |
| 36 | 4,230 10 wks. | (a) Br. 7 wks.; Mellin's 3 wks. ... (b) Cert. milk M. 7 wks. | Fair..... | 7 wks. | 80.0 | Negative | 4,790 17 wks. | Beading present; pale, flabby skin | 100 | 6 | 111.6 | Negative | 100 | .. | .. | Negative | ..... | II | B. refuses to take |
| 41 | 2,710 6 wks. | (a) Breast 6 wks. ..... (b) Br. + cert. milk M. 7 wks. | General condition poor; constipated | 7 wks. | 125.7 | Dyspepsia | 3,590 13 wks. | Fair | 50 50 Br. | 32 | 140.9 | Negative | 100 | .. | .. | Negative | ..... | I | Age |
| 45 | 4,808 12 wks. | (a) Br. 11½ wks.; Horlick's ½ wk. (b) Br. + cert. milk M. 10 wks. | Fair..... | 10 wks. | 111.2 | Constipated; eczema | 5,920 22 wks. | Sleeps poorly | 100 | 11 | 176.3 | Cough | 100 | .. | .. | Negative | ..... | I | Moved |
| 47 | 3,940 5 wks. | (a) Br., then milk mod. 5 wks. ... (b) Cert. milk M. 2 wks. | Suggestive beading at chest; Sl. scales on head | 2 wks. | 0 | ..... | 3,940 7 wks. | Suggestive beading at wrists and chest; slight scales on head | 100 | 27 | 120.3 | Sl. exudative | 100 | .. | .. | Negative | 12 60.5 26 65.5 | I | P. P. advised against |
| 48 | 5,670 24 wks. | (a) Br. 4 wks.; malted milk 20 wks. (b) Cert. milk M. with dextrimaltose 5 wks. | Pallor..... | 5 wks. | —66.0 | Constipated | 5,340 30 wks. | Exudative; rickets | 100 | 22 | 155.0 | Exudative | 100 | .. | .. | Negative | ..... | I | Age |
| 49 | 2,900 6 wks. | (a) Breast 6 wks. ..... (b) Br. + cert. milk M. 4 wks. | Flabby; skin dry and hard.. | 4 wks. | 7.5 | Dyspepsia | 2,980 10 wks. | Lues; B. thin; turgor poor; slight mottling of face | 75 25 Br. | 15 | 141.3 | Multiple boils; mottling on face disappearing; lues | 100 | .. | .. | Negative | ..... | I | M. indifferent |
| 51 | 3,840 6 wks. | (a) Br. 3 wks.; simple dil. 3 wks. (b) Cert. milk M. 2 wks. | Good..... | 2 wks. | 35.0 | Negative | 3,910 8 wks. | Good | 100 | 15 | 127.3 | Cold | 100 | .. | .. | Negative | ..... | I | Moved |
| 52 | 1,565 2 wks. | (a) Breast 2 wks. ..... (b) S.M.A. on admission | Premature; cries weakly..... | 0 | S.M.A. on adm. | S.M.A. on adm. | 1,565 2 wks. | Premature | 100 | 15 | 87.0 | Exudative | 100 | .. | .. | Medium; freq. | Birth 41.0 4 46.5 | I | Died (neglect) |
| 53 | 3,900 5 wks. | (a) Br. 4 wks; Mellin's Food 1 wk. (b) Br. + cert. milk M. 10 days | Good..... | 10 days | 120.0 (10 days) | Slight dyspepsia | 4,020 6 wks. | Good | 50 50 Br. | 10 | 214.0 | Negative | 100 | .. | .. | Negative | ..... | I | Moved |
| 57 | 5,100 19 wks. | (a) Br. 19 wks. ..... (b) Br. 4 wks. | Exudative..... | 4 wks. | 50.0 | Negative | 5,300 21 wks. | Sick (had priv. Dr.) | 50 50 Br. | 9 | 154.4 | Negative | 100 | .. | .. | Negative | ..... | I | Indifferent |
| 59 | 3,350 6 wks. | (a) Br. 4 wks.; malted milk 2 wks. (b) S.M.A. on admission | Fair..... | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,320 6 wks. | Fair | 100 | 53 | 142.4 | Negative, except boil | 100 | .. | .. | Negative | 21 62.5 | I | Age |
| 60 | 4,010 23 wks. | (a) Br. 8 wks.; then Mellin's and later milk mod. (b) S.M.A. on admission | Turgor poor; pallor..... | 0 | S.M.A. on adm. | S.M.A. on adm.; Freq. yellowish-green and green stools | 4,010 23 wks. | Same as on admission | 100 | 35 | 153.1 | Negative | 100 | .. | .. | Negative | ..... | I | Age |
| 61 | 4,260 4 wks. | (a) Breast 4 wks. ..... (b) Breast 2 wks. | Good..... | 2 wks. | 55.0 | Negative | 4,370 6 wks. | Good | 100 | 30 | 87.6 | Neg., except pneumonia | 100 | .. | .. | Negative | ..... | I | Age |
| 62 | 4,520 7 wks. | (a) Br. 3 wks.; Br. + supplementary feeding 4 wks. (b) S.M.A. on admission | Good..... | 0 | S.M.A. on adm. | S.M.A. on adm. | 4,520 7 wks. | Good | 100 | 35 | 126.5 | Furunculosis; stye; eczema | 100 | .. | .. | Negative | ..... | I | Age |
| 63 | 6,550 26 wks. | (a) Br. 6 wks.; then milk mod. with Boreherdt's; later milk mod. (b) S.M.A. on admission | Turgor fair..... | 0 | S.M.A. on adm. | S.M.A. on adm. | 6,550 26 wks. | Same as on admission | 100 | 15 | 96.6 | Negative | 100 | .. | .. | Negative | ..... | I | Age |
| 65 | 4,660 4 wks. | (a) Breast 4 wks. ..... (b) Breast 3 wks. | Good..... | 3 wks. | 203.3 | Negative | 5,270 7 wks. | Negative | 100 | 49 | 84.0 | Negative | 90 | 10 | .. | Negative | ..... | I | Age |
| 69 | 3,270 4 wks. | (a) Breast 4 wks. ..... (b) Breast 11 wks. | Fung. umbilicus; constip.; stools green with mucus | 11 wks. | 70.9 | Bowels more regular, yellow and green | 4,050 15 wks. | Negative | 75 25 Br. | 45 | 128.8 | Negative | 100 | .. | .. | Negative | ..... | I | Age |
| 70 | 5,950 26 wks. | (a) Br. 22 wks.; Horlick's 4 wks. (b) Cert. milk M. 3 wks. | Negative..... | 3 wks. | — 40.0 | Negative | 5,950 29 wks. | Good | 100 | 10 | 164.0 | Tonsillitis | 100 | .. | .. | Negative | ..... | I | Age |
| 72 | 5,370 22 wks. | (a) Cert. milk, then cond. milk 22 wks. (b) S.M.A. on admission | Turgor poor; pallor; exudative | 0 | S.M.A. on adm. | S.M.A. on adm. | 5,370 22 wks. | Same as on admission | 100 | 48 | 149.7 | Negative | 100 | .. | .. | Negative | ..... | I | Age |
| 73 | 4,890 23 wks. | (a) Br. 1 mo.; Horlick's 3 days; mod. milk 1 mo., then cert. skimmed, then cert. (b) S.M.A. on admission | Cond. not good; left inguinal gland enlarged | 0 | S.M.A. on adm. | S.M.A. on adm. | 4,890 23 wks. | Same as on admission | 100 | 10 | 131.0 | Negative | 80 | 20 | .. | Negative | ..... | III (Bad home cond.) | Did not ret. |
| 74 | 3,800 8 wks. | (a) Br. + milk mod. 8 wks; ..... (b) S.M.A. on admission | Malnutrition..... | 0 | S.M.A. on adm. | Projectile vomiting after feeeding | 3,800 8 wks. | Exudative | 75 25 Br. | 36 | 112.5 | Vomited breast milk but not S.M.A. | 100 | .. | .. | Medium; freq. (for 1st 7 mos.) | ..... | I | Moved |
| 76 | 3,140 10 wks. | (a) Br. 4 wks.; then br. + milk mod. 6 wks. (b) S.M.A. on admission | Malnutrition..... | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,140 10 wks. | Same as on admission | 100 | 33 | 145.1 | Negative | 100 | .. | .. | Negative | ..... | I | Age |
| 79 | 2,940 3 wks. | (a) Breast 3 wks. ..... (b) Breast 2 wks. | Turgor fair..... | 2 wks. | 30.0 | Negative | 3,000 5 wks. | Same as on admission | 75 25 Br. | 41 | 122.9 | Negative | 100 | .. | .. | Negative | ..... | I | Age |
| 80 | 4,160 9 wks. | (a) Breast 9 wks. ..... (b) S.M.A. on admission | Good..... | 0 | S.M.A. on adm. | S.M.A. on adm. | 4,160 9 wks. | Same as on admission | 100 | 31 | 146.1 | Bronchitis | 100 | .. | .. | Negative | ..... | I | Age |
| 81 | 3,090 4 wks. | (a) Breast 4 wks. ..... (b) Breast 1 wk. | Exudative..... | 1 wk. | 20.0 | Negative | 3,110 5 wks. | Same as on admission | 75 | 33 | 165.7 | Negative | 100 | .. | .. | Slight; ... | ..... | I | ... |

| | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 73 | 4,890 | 23 wks. | (a) Br. 1 mo.; Horlick's 3 days; mod. milk 1 mo., then cert. skimmed, then cert.<br>(b) S.M.A. on admission | Cond. not good; left inguinal gland enlarged | 0 | S.M.A. on adm. | S.M.A. on adm. | 5,890 | 23 wks. | Same as on admission | 50 | 16 | 251.0 | Negative | 80 | 20 | .. | Negative | ..... | III (Bad home cond.) | Did not ret. |
| 74 | 3,800 | 8 wks. | (a) Br. + milk mod. 8 wks.<br>(b) S.M.A. on admission | Malnutrition | 0 | S.M.A. on adm. | Projectile vomiting after feeeding | 3,800 | 8 wks. | Exudative | 75<br>25 Br. | 36 | 112.5 | Vomited breast milk but not S.M.A. | 100 | .. | .. | Medium; freq. (for 1st 7 mos.) | ..... | I | Moved |
| 76 | 3,140 | 10 wks. | (a) Br. 4 wks.; then br. + milk mod. 6 wks.<br>(b) S.M.A. on admission | Malnutrition | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,140 | 10 wks. | Same as on admission | 100 | 33 | 145.1 | Negative | 100 | .. | .. | Negative | ..... | I | Age |
| 79 | 2,940 | 3 wks. | (a) Breast 3 wks.<br>(b) Breast 2 wks. | Turgor fair | 2 wks. | 30.0 | Negative | 3,000 | 5 wks. | Same as on admission | 75<br>25 Br. | 41 | 132.9 | Negative | 100 | .. | .. | Negative | ..... | I | Age |
| 80 | 4,160 | 9 wks. | (a) Breast 9 wks.<br>(b) S.M.A. on admission | Good | 0 | S.M.A. on adm. | S.M.A. on adm. | 4,160 | 9 wks. | Same as on admission | 100 | 31 | 146.1 | Bronchitis | 100 | .. | .. | Negative | ..... | I | Age |
| 81 | 3,090 | 4 wks. | (a) Breast 4 wks.<br>(b) Breast 1 wk. | Exudative | 1 wk. | 20.0 | Negative | 3,110 | 5 wks. | Same as on admission | 75<br>25 Br. | 33 | 165.7 | Negative | 100 | .. | .. | Slight; rare | ..... | I | Did not ret. |
| 82 | 3,940 | 15 wks. | (a) Br. 8 wks.; cert. milk M. 7 wks.<br>(b) S.M.A. on admission | Fair | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,940 | 15 wks. | Same as on admission | 100 | 29 | 130.6 | Severe cold; sl. dyspepsia due to nondelivery of S.M.A. | 100 | .. | .. | Negative | ..... | II | Age |
| 83 | 4,000 | 17 wks. | (a) Breast 14 wks.; cert. milk M. 3 wks.<br>(b) S.M.A. on admission | Turgor fair; pallor | 0 | S.M.A. on adm. | S.M.A. on adm. | 4,000 | 17 wks. | Same as on admission | 100 | 42 | 110.0 | Whooping cough; dyspepsia 1 time | 90 | .. | 10 | Negative | ..... | I | Age |
| 84 | 3,470 | 5 wks. | (a) Breast 5 wks.<br>(b) Breast 6 wks. | Good | 6 wks. | 0 | Negative | 3,470 | 11 wks. | Good | 75<br>25 Br. | 42 | 113.0 | Negative | 100 | .. | .. | Negative | ..... | I | Age |
| 86 | 4,350 | 15 wks. | (a) Br. 14 wks.; milk mod. 1 wk.<br>(b) Breast 2 days | Good | 2 days | —110.0<br>(for 2 days) | Negative | 4,240 | 15 wks. | Good | 75<br>25 Br. | 33 | 166.3 | Negative | 75 | 25 | .. | Slight; rare | ..... | I | Moved |
| 87 | 3,850 | 10 wks. | (a) Br. + milk mod. 10 wks.<br>(b) Breast 5 wks. | Fair | 5 wks. | 570.0 | Negative | 4,420 | 15 wks. | Good | 50<br>50 Br. | 32 | 109.3 | Negative | 100 | .. | .. | Negative | ..... | II | Enteritis follicularis |
| 88 | 4,000 | 3 wks. | (a) Breast 3 wks.<br>(b) Br. + cert. milk M. 6 wks. | Good; thrush | 6 wks. | 36.6 | Negative except constipated | 4,220 | 9 wks. | Good | 100 | 26 | 100.7 | Pallor | 100 | .. | .. | Slight; rare | ..... | III | Lack of appetite |
| 89 | 3,250 | 3 wks. | (a) Breast 3 wks.<br>(b) Breast 1 wk. | Fair | 1 wk. | 120.0 | Negative | 3,370 | 4 wks. | Fair | 100 | 41 | 140.4 | Eczema; dyspepsia | 60 | 40 | .. | Negative | ..... | I | Age |
| 92 | 3,970 | 10 wks. | (a) Br. 8 wks.; cert. milk M. 2 wks.<br>(b) Cert. milk M. 9 wks. | Exudative | 9 wks. | 45.5 | Negative | 4,380 | 19 wks. | Negative | 100 | 19 | 143.1 | Negative | 100 | .. | .. | Negative | ..... | I | Moved |
| 93 | 3,190 | 4 wks. | (a) Br. + milk mod. 4 wks.<br>(b) Br. + cert. milk M. 3 wks. | Sl. paresis of rt. arm | 3 wks. | 73.3 | Stools green | 3,410 | 7 wks. | Same as on admission | 100 | 15 | 117.3 | Eczema | 90 | 10 | .. | Negative | ..... | I | M. indifferent |
| 95 | 4,150 | 6 wks. | (a) Breast 6 wks.<br>(b) Breast 1 wk. | Fair; constipated | 1 wk. | —50.0 | Constipated | 4,100 | 7 wks. | Fair | 75<br>25 Br. | 6 | 216.6 | Improved | 85 | 15 | .. | Negative | ..... | I | Moved |
| 96 | 3,445 | 14 wks. | (a) Br. 4 wks.; Br. + Mellin's; then cert. milk M.<br>(b) Cert. milk M. 1 wk. | Fair | 1 wk. | 5.0 | Hard stools | 3,450 | 15 wks. | Fair | 100 | 27 | 137.0 | Negative | 10 | 80 | 10 | Slight; rare | ..... | I | Age |
| 97 | 5,070 | 12 wks. | (a) Br. 8 wks.; Mellin's 4 wks.<br>(b) S.M.A. on admission | Fair | 0 | S.M.A. on adm. | S.M.A. on adm. | 5,070 | 12 wks. | Same as on admission | 100 | 47 | 90.0 | Negative | 100 | .. | .. | Negative | ..... | I | Age |
| 99 | 4,700 | 12 wks. | (a) Breast 12 wks.<br>(b) Br.; then malted milk; cert. milk M. 1 wk. | Skin dry; eyes discharging; eczema; pallor | 10 wks. | 78.0 | Thrush | 5,480 | 22 wks. | Fair; better | 100 | 18 | 88.8 | Negative | 100 | .. | .. | Negative | ..... | I | Age |
| 100 | 4,800 | 10 wks. | (a) Br. 3 wks.; Br. + milk mod.; then Mellin's<br>(b) S.M.A. on admission | Good | 0 | S.M.A. on adm. | S.M.A. on adm. | 4,800 | 10 wks. | Same as on admission | 100 | 35 | 130.2 | Negative | 100 | .. | .. | Slight; rare | ..... | I | Age |
| 101 | 3,470 | 4 wks. | (a) Breast 3 wks.<br>(b) S.M.A. on admission | Pustules on body; losing in weight | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,470 | 4 wks. | Same as on admission | 50<br>50 Br. | 44 | 129.0 | Negative | 90 | 10 | .. | Negative | ..... | I | Age |
| 102 | 4,220 | 6 wks. | (a) Breast 6 wks.<br>(b) Breast 3 days | Good | 3 days | 30.0<br>(for 3 days) | Negative | 4,350 | 6 wks. | Good | 100 | 23 | 120.0 | Dyspepsia 1 time | 100 | .. | .. | Negative | ..... | I | Age |
| 103 | 3,710 | 14 wks. | (a) Br. 1 wk.; milk mod. 13 wks.<br>(b) S.M.A. on admission | Thin | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,710 | 14 wks. | Sl. constipated; thin | 100 | 16 | 145.0 | Negative | 30 | 40 | 30 | Medium; rare | ..... | II | Dyspepsia |
| 105 | 4,300 | 8 wks. | (a) Breast 8 wks.<br>(b) Breast 1 wk. | Neg.; umbilical hernia | 1 wk. | 40.0 | Negative | 4,340 | 9 wks. | Negative | 100 | 20 | 124.0 | Sl. dyspepsia 1 time | 90 | 10 | .. | Negative | ..... | I | Moved |
| 106 | 5,380 | 13 wks. | (a) Breast 13 wks.<br>(b) Breast 10 days | Good | 10 days | 40.0<br>(10 days) | Negative | 5,420 | 14 wks. | Good | 75<br>25 Br. | 34 | 156.4 | Negative | 100 | .. | .. | Negative | ..... | I | Dyspepsia |
| 108 | 4,480 | 11 wks. | (a) Br. + milk mod. 11 wks.<br>(b) S.M.A. on admission | Good | 0 | S.M.A. on adm. | S.M.A. on adm. | 4,480 | 11 wks. | Same as on admission | 100 | 34 | 159.7 | Negative | 5 | 80 | 15 | Negative | ..... | II | Age |
| 109 | 5,230 | 16 wks. | (a) Br. + simple dil. 16 wks.<br>(b) S.M.A. on admission | Fair; 3 convul. 1st week; eczema on head and back of ears | 0 | S.M.A. on adm. | S.M.A. on adm. | 5,230 | 16 wks. | Same as on admission | 75<br>25 Br. | 15 | 74.0 | Dyspepsia 1 time | 60 | 40 | .. | Negative | ..... | I | Age |
| 110 | 5,840 | 7 wks. | (a) Breast 7 wks.<br>(b) Breast 9 wks. | Good | 9 wks. | 78.8 | Negative | 6,550 | 16 wks. | Good | 100 | 18 | 122.7 | Pertussis | 100 | .. | .. | Medium; rare | ..... | I | Private Dr. advised against |
| 111 | 4,850 | 15 wks. | (a) Br. 2 wks.; cert. milk M. 13 wks.<br>(b) S.M.A. on admission | Eczema | 0 | S.M.A. on adm. | S.M.A. on adm. | 4,850 | 15 wks. | Same as on admission | 100 | 32 | 133.7 | Eczema improved | 100 | .. | .. | Neg. except for whooping cough | ..... | I | Age |
| 112 | 2,950 | 6 wks. | (a) Br. 4 wks.; cert. milk M. 2 wks.<br>(b) S.M.A. on admission | Very thin; small | 0 | S.M.A. on adm. | S.M.A. on adm. | 2,950 | 6 wks. | Same as on admission | 100 | 38 | 127.8 | Negative | 100 | .. | .. | Slight; rare | ..... | I | Age |
| 113 | 5,110 | 7 wks. | (a) Br. 5 wks.; cert. milk M. + breast 2 wks.<br>(b) Breast 2 days | Good | 3 days | —60.0<br>(3 days) | Negative | 5,050 | 7 wks. | Good | 75<br>25 Br. | 26 | 101.9 | Cold, 1-2 times; bronchitis | 100 | .. | .. | Negative | ..... | I | Age |
| 114 | 3,300 | 4 wks. | (a) Br. + simple dil. 4 wks.<br>(b) S.M.A. on admission | Thrush | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,300 | 4 wks. | Same as on admission | 100 | 11 | 125.4 | Severe dyspepsia 2 times | 20 | 80 | .. | Negative | ..... | II | Age |
| 115 | 2,640 | 6 wks. | (a) Breast 6 wks.<br>(b) Breast 10 days | Good | 10 days | 70.0<br>(10 days) | Constipated | 2,710 | 7 wks. | Good | 50<br>50 Br. | 39 | 165.3 | Negative except constipated | 90 | 10 | .. | Negative | ..... | I | Age |
| 116 | 4,560 | 14 wks. | (a) Cert. milk M. 14 wks.<br>(b) S.M.A. on admission | Fair | 0 | S.M.A. on adm. | S.M.A. on adm. | 4,560 | 14 wks. | Same as on admission | 100 | 25 | 100.4 | Negative except cold 1 time | 80 | 20 | .. | Slight; rare | ..... | I | Not gaining |
| 117 | 6,350 | 23 wks. | (a) Breast 23 wks.<br>(b) Breast 3 wks. | Good | 3 wks. | 56.6 | Not gaining | 6,520 | 26 wks. | Good | 75<br>25 Br. | 27 | 92.9 | Negative | 100 | .. | .. | Negative | ..... | I | Age |
| 118 | 4,350 | 7 wks. | (a) Breast 7 wks.<br>(b) S.M.A. on admission | Well developed and nourished | 0 | S.M.A. on adm. | S.M.A. on adm. | 4,350 | 7 wks. | Same as on admission | 100 | 25 | 95.6 | Negative | 100 | .. | .. | Negative | ..... | I | Indifference |
| 119 | 4,000 | 5 wks. | (a) Breast 5 wks.<br>(b) Breast 3 wks. | Negative | 3 wks. | 166.6 | Negative | 4,500 | 8 wks. | Negative | 75<br>25 Br. | 31 | 142.5 | Negative | 100 | .. | .. | Negative | ..... | I | Vomiting |
| 120 | 3,100 | 4 wks. | (a) Breast 4 wks.<br>(b) Breast 1 wk. | Good | 1 wk. | 0 | Not gaining | 3,100 | 5 wks. | Good | 50<br>50 Br. | 22 | 141.3 | Negative | 50 | 50 | .. | Negative | ..... | I | Did not take well |
| 121 | 3,830 | 17 wks. | (a) Br. 16 wks.; Br. + malted milk 1 wk.<br>(b) S.M.A. on admission | Pallor | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,830 | 17 wks. | Same as on admission | 100 | 15 | 176.0 | Dyspepsia 1 time | 80 | .. | 20 | Negative | ..... | I | Moved |
| 122 | 4,510 | 22 wks. | (a) Br. only few days, then artificial food<br>(b) S.M.A. on admission | Eczema | 0 | S.M.A. on adm. | S.M.A. on adm. | 4,510 | 22 wks. | Same as on admission | 100 | 10 | 69.0 | Dyspepsia | 85 | .. | 15 | Slight; rare | ..... | II | Private Dr. advised against |
| 124 | 3,780 | 2 wks. | (a) Br. 1 day; 1 qt. straight milk per day 13 days<br>(b) Cert. milk M. 14 wks. | O. K. except fungus umbilicus | 14 wks. | 96.3 | Negative | 5,130 | 16 wks. | Mongolian type | 100 | 22 | 166.7 | Negative | 100 | .. | .. | Negative | ..... | I | Age |
| 125 | 4,510 | 9 wks. | (a) Br. + milk 9 wks.<br>(b) S.M.A. on admission | Good; turgor fair | 0 | S.M.A. on adm. | S.M.A. on adm. | 4,510 | 9 wks. | Same as on admission | 75<br>25 Br. | 21 | 120.0 | Negative | 100 | .. | .. | Medium; rare | ..... | I | Vomiting |
| 126 | 4,460 | 7 wks. | (a) Br. 1 wk.; milk mod. 6 wks.<br>(b) S.M.A. on admission | Eczema on face | 0 | S.M.A. on adm. | S.M.A. on adm. | 4,460 | 7 wks. | Same as on admission | 100 | 11 | 80.9 | Negative | 100 | .. | .. | Negative | ..... | I | Private Dr. advised against |
| 127 | 3,020 | 3 wks. | (a) Br. 2 wks.; Mellin's food 1 wk.<br>(b) S.M.A. on admission | Good | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,020 | 3 wks. | Same as on admission | 100 | 11 | 140.0 | Dyspepsia; otitis media | 90 | .. | 10 | Slight; rare | ..... | II | Dyspepsia |
| 128 | 5,420 | 13 wks. | (a) Breast 13 wks.<br>(b) Breast 7 wks. | Good | 7 wks. | 114.2 | Negative | 6,220 | 20 wks. | Good | 100 | 24 | 59.1 | Negative | 60 | 40 | .. | Medium; freq. | ..... | I | Age |
| 131 | 2,630 | 7 wks. | (a) Breast 7 wks.<br>(b) S.M.A. on admission | Good; turgor poor | 0 | S.M.A. on adm. | S.M.A. on adm. | 2,630 | 7 wks. | Same as on admission | 75<br>25 Br. | 12 | 28.3 | Pertussis after last wt.; home cond. very bad | 100 | .. | .. | Negative | ..... | I | Died (pertussis) |
| 133 | 5,200 | 17 wks. | (a) Breast 17 wks.<br>(b) S.M.A. on admission | Dyspepsia | 0 | S.M.A. on adm. | S.M.A. on adm. | 5,200 | 27 wks. | Same as on admission | 100 | 13 | 105.3 | Negative | 100 | .. | .. | Medium; rare | ..... | I | M. indifferent |
| 134 | 4,250 | 11 wks. | (a) Breast 11 wks.<br>(b) Breast 5 wks. | Good | 5 wks. | —2.0 | Negative | 4,240 | 16 wks. | Good; lost weight | 50<br>50 Br. | 34 | 176.7 | Negative | 100 | .. | .. | Negative | ..... | I | Age |
| 135 | 2,721 | 2 wks. | (a) Simple dil. 2 wks.<br>(b) S.M.A. on admission | Dyspepsia II; enlarged thyroid | 0 | S.M.A. on adm. | S.M.A. on adm. | 2,721 | 2 wks. | Same as on admission | 100 | 15 | 117.4 | Sick? private Dr. | 100 | .. | .. | Negative | ..... | II | Private Dr. advised against |
| 136 | 5,800 | 19 wks. | (a) Breast 19 wks.<br>(b) Breast 3 wks. | Good | 3 wks. | 133.3 | Negative | 6,200 | 22 wks. | Good | 50<br>50 Br. | 21 | 96.6 | Negative | 100 | .. | .. | Negative | ..... | I | B. refuses to take |
| 137 | 3,620 | 8 wks. | (a) Breast 8 wks.<br>(b) Breast 2 wks. | Negative | 2 wks. | 165.0 | Negative | 3,950 | 10 wks. | Negative | 75<br>25 Br. | 25 | 154.4 | Negative | 90 | 10 | .. | Slight; rare | ..... | I | Not taking food well |
| 138 | 4,350 | 12 wks. | (a) Horlick's 12 wks.<br>(b) S.M.A. on admission | Good | 0 | S.M.A. on adm. | S.M.A. on adm. | 4,350 | 12 wks. | Same as on admission | 100 | 33 | 159.0 | Bronchitis | 100 | .. | .. | Negative | ..... | I | Age |
| 139 | 3,120 | 3 wks. | (a) Br. + supplementary feeding 3 wks.<br>(b) S.M.A. on admission | Good | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,120 | 3 wks. | Same as on admission | 50<br>50 Br. | 33 | 193.3 | Negative | 100 | .. | .. | Negative | ..... | I | Still on S.M.A. |
| 142 | 5,080 | 15 wks. | (a) Br. + Horlick's 15 wks.<br>(b) S.M.A. on admission | Good | 0 | S.M.A. on adm. | S.M.A. on adm. | 5,080 | 15 wks. | Same as on admission | 75<br>25 Br. | 30 | 130.3 | Negative | 100 | .. | .. | Negative | ..... | I | Age |
| 143 | 5,700 | 18 wks. | (a) Br. + Horlick's 18 wks.<br>(b) S.M.A. on admission | Good | 0 | S.M.A. on adm. | S.M.A. on adm. | 5,700 | 18 wks. | Same as on admission | 100 | 24 | 105.4 | Dyspepsia 2, times | 80 | .. | 20 | Negative | ..... | I | Age |
| 146 | 5,280 | 12 wks. | (a) Br. + simple dil. 12 wks.<br>(b) S.M.A. on admission | Good | 0 | S.M.A. on adm. | S.M.A. on adm. | 5,280 | 12 wks. | Same as on admission | 100 | 29 | 116.2 | Negative | 100 | .. | .. | Negative | ..... | I | Still on S.M.A. |
| 147 | 3,590 | 7 wks. | (a) Br. 5 wks.; cert. milk M. 2 wks.<br>(b) S.M.A. on admission | Good | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,590 | 7 wks. | Same as on admission | 100 | 28 | 132.5 | Negative | 40 | 60 | .. | Negative | ..... | I | Still on S.M.A. |
| 148 | 3,200 | 11 wks. | (a) Breast 11 wks.<br>(b) S.M.A. on admission | Malnutrition; pylorospasm | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,200 | 11 wks. | Same as on admission | 100 | 29 | 187.9 | Negative | 90 | 10 | .. | Negative | ..... | I | Still on S.M.A. |
| 149 | 2,300 | 10 wks. | (a) Breast 10 wks.<br>(b) Breast 3 days | Poor | 3 days | —60.0<br>(3 days) | Same as on adm. | 2,240 | 10 wks. | Lost weight | 50<br>50 Br. | 21 | 159.5 | Negative | 100 | .. | .. | Slight; rare | ..... | I | Moved |
| 150 | 3,950 | 19 wks. | (a) Br. 6 wks.; cert. milk M. 13 wks.<br>(b) Cert. milk M. 3 wks. | Normal prophylactic | 3 wks. | —26.6 | Negative | 3,870 | 22 wks. | Negative | 100 | 8 | 206.2 | Eczema | 100 | .. | .. | Negative | ..... | I | Moved |
| 151 | 3,070 | 6 wks. | (a) Breast 6 wks.<br>(b) Breast 1 wk. | Umbilical hernia; fung. umbilicus | 1 wk. | 0 | Negative | 3,070 | 7 wks. | Same as on admission | 50<br>50 Br. | 28 | 148.2 | Negative | 100 | .. | .. | Slight; rare | ..... | I | Still on S.M.A. |
| 154 | 4,030 | 10 wks. | (a) Br. 4 wks.; Br. + cert. milk 6 wks.<br>(b) S.M.A. on admission | Turgor fair | 0 | S.M.A. on adm. | S.M.A. on adm. | 4,030 | 10 wks. | Same as on admission | 50<br>50 Br. | 29 | 103.7 | Negative | 100 | .. | .. | Medium; rare | ..... | I | Not gaining |
| 155 | 4,150 | 17 wks. | (a) Br. 12 wks.; then prepared food; then O.M.W. + cond. milk<br>(b) S.M.A. on admission | Very thin; turgor poor | 0 | S.M.A. on adm. | S.M.A. on adm. | 4,150 | 17 wks. | Same as on admission | 100 | 26 | 184.2 | Negative | 90 | 10 | .. | Negative | ..... | I | Still on S.M.A. |
| 157 | 4,900 | 18 wks. | (a) Br. 12 wks.; Mellin's 3 wks.; milk mod. 3 wks.<br>(b) S.M.A. on admission | Turgor fair | 0 | S.M.A. on adm. | S.M.A. on adm. | 4,900 | 18 wks. | Same as on admission | 100 | 24 | 98.7 | Bronchitis; acute otitis media | 75 | 25 | .. | Negative | ..... | II | Age |
| 160 | 6,570 | 17 wks. | (a) Breast 17 wks.<br>(b) Breast 2 wks. | Good | 2 wks. | 80.0 | Negative | 6,730 | 19 wks. | Negative | 50<br>50 Br. | 17 | 92.3 | Negative | 100 | .. | .. | Negative | ..... | I | Not gaining |
| 161 | 3,720 | 7 wks. | (a) Br. 1 wk.; cond. milk 6 wks.<br>(b) S.M.A. on admission | Good | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,720 | 7 wks. | Same as on admission | 100 | 7 | 100.0 | Negative | 100 | .. | .. | Medium; rare | ..... | I | Moved |
| 162 | 5,290 | 14 wks. | (a) Br. + oatmeal water 14 wks.<br>(b) Breast 4 days | Turgor fair | 4 days | 80.0<br>(4 days) | Same as on adm. | 5,370 | 14½ wks. | Same as on admission | 75<br>25 Br. | 12 | 132.5 | Negative | 100 | .. | .. | Slight; rare | ..... | I | Indifferent |
| 163 | 4,270 | 36 wks. | (a) Br. 21 wks.; Br. + malted milk 15 wks.<br>(b) S.M.A. on admission | Very thin; rickets; large head | 0 | S.M.A. on adm. | S.M.A. on adm. | 4,270 | 36 wks. | Same as on admission | 100 | 11 | 102.7 | Neg., except rickets | 100 | .. | .. | Negative | ..... | I | Refuses to take |
| 164 | 5,840 | 16 wks. | (a) Br. 8 wks.; cert. milk 8 wks.<br>(b) S.M.A. on admission | Anemic | 0 | S.M.A. on adm. | S.M.A. on adm. | 5,840 | 16 wks. | Same as on admission | 100 | 24 | 102.9 | Negative | 100 | .. | .. | Negative | ..... | I | Age |
| 165 | 4,320 | 8 wks. | (a) Br. 5 wks.; milk mod. 3 wks. | Good | 0 | S.M.A. on adm. | S.M.A. on adm. | 4,320 | 8 wks. | Same as on admission | 100 | 13 | 102.3 | Negative | 100 | .. | .. | Slight; rare | ..... | I | Not gaining |
| | | | | | | | | | | | | | | | | | | | | | Still on S.M.A. |

| | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | (b) Breast 2 wks. | | | | | | | | | | | | | | | | | | | | |
| 138 | 4,350 | 12 wks. | (a) Horlick's 12 wks. | Good | 0 | S.M.A. on adm. | S.M.A. on adm. | 4,350 | 12 wks. | Same as on admission | 100 | | 25 | 184.4 | Negative | | | | Negative | | I | Age |
| | | | (b) S.M.A. on admission | | | | | | | | | | 25 Br. | | | | | | | | | |
| 139 | 3,120 | 3 wks. | (a) Br. + supplementary feeding 3 wks. | Good | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,120 | 3 wks. | Same as on admission | 50 | | 33 | 193.3 | Negative | 100 | .. | .. | Negative | | I | Still on S.M.A. |
| | | | (b) S.M.A. on admission | | | | | | | | 50 Br. | | | | | | | | | | | |
| 142 | 5,080 | 15 wks. | (a) Br. + Horlick's 15 wks. | Good | 0 | S.M.A. on adm. | S.M.A. on adm. | 5,080 | 15 wks. | Same as on admission | 75 | | 30 | 130.3 | Negative | 100 | .. | .. | Negative | | I | Age |
| | | | (b) S.M.A. on admission | | | | | | | | 25 Br. | | | | | | | | | | | |
| 143 | 5,700 | 18 wks. | (a) Br. + Horlick's 18 wks. | Good | 0 | S.M.A. on adm. | S.M.A. on adm. | 5,700 | 18 wks. | Same as on admission | 100 | | 24 | 105.4 | Dyspepsia 2, times | 80 | .. | 20 | Negative | | I | Age |
| | | | (b) S.M.A. on admission | | | | | | | | | | | | | | | | | | | |
| 146 | 5,280 | 12 wks. | (a) Br. + simple dil. 12 wks. | Good | 0 | S.M.A. on adm. | S.M.A. on adm. | 5,280 | 12 wks. | Same as on admission | 100 | * | 29 | 116.2 | Negative | 100 | .. | .. | Negative | | I | Still on S.M.A. |
| | | | (b) S.M.A. on admission | | | | | | | | | | | | | | | | | | | |
| 147 | 3,590 | 7 wks. | (a) Br. 5 wks.; cert. milk M. 2 wks. | Good | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,590 | 7 wks. | Same as on admission | 100 | | 28 | 132.5 | Negative | 40 | 60 | .. | Negative | | I | Still on S.M.A. |
| | | | (b) S.M.A. on admission | | | | | | | | | | | | | | | | | | | |
| 148 | 3,200 | 11 wks. | (a) Breast 11 wks. | Malnutrition; pylorospasm | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,200 | 11 wks. | Same as on admission | 100 | | 29 | 187.9 | Negative | 90 | 10 | .. | Negative | | I | Still on S.M.A. |
| | | | (b) S.M.A. on admission | | | | | | | | | | | | | | | | | | | |
| 149 | 2,300 | 10 wks. | (a) Breast 10 wks. | Poor | 3 days | —60.0 (3 days) | Same as on adm. | 2,240 | 10 wks. | Lost weight | 50 | | 21 | 159.5 | Negative | 100 | .. | .. | Slight; rare | | I | Moved |
| | | | (b) Breast 3 days | | | —29.6 | | | | | 50 Br. | | | | | | | | | | | |
| 150 | 3,950 | 19 wks. | (a) Br. 6 wks.; cert. milk M. 13 wks. | Normal prophylactic | 3 wks. | | Negative | 3,870 | 22 wks. | Negative | 100 | | 8 | 206.2 | Eczema | 100 | .. | .. | Negative | | I | Moved |
| | | | (b) Cert. milk M. 3 wks. | | | | | | | | | | | | | | | | | | | |
| 151 | 3,070 | 6 wks. | (a) Breast 6 wks. | Umbilical hernia; fung. umbilicus | 1 wk. | 0 | Negative | 3,070 | 7 wks. | Same as on admission | 50 | | 28 | 148.2 | Negative | 100 | .. | .. | Slight; rare | | I | Still on S.M.A. |
| | | | (b) Breast 1 wk. | | | | | | | | 50 Br. | | | | | | | | | | | |
| 154 | 4,030 | 10 wks. | (a) Br. 4 wks.; Br. + cert. milk 6 wks. | Turgor fair | 0 | S.M.A. on adm. | S.M.A. on adm. | 4,030 | 10 wks. | Same as on admission | 50 | | 29 | 103.7 | Negative | 100 | .. | .. | Medium; rare | | I | Not gaining |
| | | | (b) S.M.A. on admission | | | | | | | | 50 Br. | | | | | | | | | | | |
| 155 | 4,150 | 17 wks. | (a) Br. 12 wks.; then prepared food; then O.M.W. + cond. milk | Very thin; turgor poor | 0 | S.M.A. on adm. | S.M.A. on adm. | 4,150 | 17 wks. | Same as on admission | 100 | | 26 | 184.2 | Negative | 90 | 10 | .. | Negative | | I | Still on S.M.A. |
| | | | (b) S.M.A. on admission | | | | | | | | | | | | | | | | | | | |
| 157 | 4,900 | 18 wks. | (a) Br. 12 wks.; Mellin's 3 wks.; milk mod. 3 wks. | Turgor fair | 0 | S.M.A. on adm. | S.M.A. on adm. | 4,900 | 18 wks. | Same as on admission | 100 | | 24 | 98.7 | Bronchitis; acute otitis media | 75 | 25 | .. | Negative | | II | Age |
| | | | (b) S.M.A. on admission | | | | | | | | | | | | | | | | | | | |
| 160 | 6,570 | 17 wks. | (a) Breast 17 wks. | Good | 2 wks. | 80.0 | Negative | 6,730 | 19 wks. | Negative | 50 | | 17 | 92.3 | Negative | 100 | .. | .. | Negative | | I | Not gaining |
| | | | (b) Breast 2 wks. | | | | | | | | 50 Br. | | | | | | | | | | | |
| 161 | 3,720 | 7 wks. | (a) Br. 1 wk.; cond. milk 6 wks. | Good | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,720 | 7 wks. | Same as on admission | 100 | | 7 | 100.0 | Negative | 100 | .. | .. | Medium; rare | | I | Moved |
| | | | (b) S.M.A. on admission | | | | | | | | | | | | | | | | | | | |
| 162 | 5,290 | 14 wks. | (a) Br. + oatmeal water 14 wks. | Turgor fair | 4 days | 80.0 (4 days) | Same as on adm. | 5,370 | 14½ wks. | Same as on admission | 75 | | 12 | 132.5 | Negative | 100 | .. | .. | Slight; rare | | I | Indifferent |
| | | | (b) Breast 4 days | | | | | | | | 25 Br. | | | | | | | | | | | |
| 163 | 4,270 | 36 wks. | (a) Br. 21 wks.; Br. + malted milk 15 wks. | Very thin; rickets; large head | 0 | S.M.A. on adm. | S.M.A. on adm. | 4,270 | 36 wks. | Same as on admission | 100 | | 11 | 162.7 | Neg., except rickets | 100 | .. | .. | Negative | | I | Refuses to take |
| | | | (b) S.M.A. on admission | | | | | | | | | | | | | | | | | | | |
| 164 | 5,840 | 16 wks. | (a) Br. 8 wks.; cert. milk 8 wks. | Anemic | 0 | S.M.A. on adm. | S.M.A. on adm. | 5,840 | 16 wks. | Same as on admission | 100 | | 24 | 102.9 | Negative | 100 | .. | .. | Negative | | I | Age |
| | | | (b) S.M.A. on admission | | | | | | | | | | | | | | | | | | | |
| 165 | 4,320 | 8 wks. | (a) Br. 5 wks.; milk mod. 3 wks. | Good | 0 | S.M.A. on adm. | S.M.A. on adm. | 4,320 | 8 wks. | Same as on admission | 100 | | 13 | 102.3 | Negative | 100 | .. | .. | Slight; rare | | I | Not gaining |
| | | | (b) S.M.A. on admission | | | | | | | | | | | | | | | | | | | |
| 166 | 3,010 | 11 wks. | (a) Br. 8 wks.; Br. + cert. milk 3 wks. | Malnutrition; turgor very poor | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,010 | 11 wks. | Same as on admission | 75 | | 23 | 165.2 | Negative | 100 | .. | .. | Negative | | I | Still on S.M.A. |
| | | | (b) S.M.A. on admission | | | | | | | | 25 Br. | | | | | | | | | | | |
| 167 | 3,600 | 4 wks. | (a) Br. few days; then Br. + Jersey milk | Good | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,600 | 4 wks. | Same as on admission | 100 | | 25 | 160.8 | Cold; otherwise neg. | 90 | 10 | .. | Negative | | I | Still on S.M.A. |
| | | | (b) S.M.A. on admission | | | | | | | | | | | | | | | | | | | |
| 168 | 4,350 | 12 wks. | (a) Br. 2 wks.; malted milk 10 wks. | Good | 0 | S.M.A. on adm. | S.M.A. on adm. | 4,350 | 12 wks. | Same as on admission | 100 | | 21 | 144.7 | Lost appetite 1 time | 100 | .. | .. | Negative | | I | Still on S.M.A. |
| | | | (b) S.M.A. on admission | | | | | | | | | | | | | | | | | | | |
| 169 | 3,750 | 5 wks. | (a) Br. 1 wk.; cond. milk 4 wks. | Eczema on face | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,750 | 5 wks. | Same as on admission | 100 | | 22 | 175.0 | Negative | 75 | 25 | .. | Negative | | I | Still on S.M.A. |
| | | | (b) S.M.A. on admission | | | | | | | | | | | | | | | | | | | |
| 172 | 6,600 | 23 wks. | (a) Br. 17 wks.; Horlick's 6 wks. | Sl. eczema | 0 | S.M.A. on adm. | S.M.A. on adm. | 6,600 | 23 wks. | Same as on admission | 75 | | 13 | 73.8 | Negative | 100 | .. | .. | Medium; rare | | II | Vomiting |
| | | | (b) S.M.A. on admission | | | | | | | | 25 Br. | | | | | | | | | | | |
| 173 | 4,520 | 13 wks. | (a) Br. 4 wks.; Br. + Horlick's 7 wks. | Good | 0 | S.M.A. on adm. | S.M.A. on adm. | 4,520 | 13 wks. | Same as on admission | 100 | | 20 | 174.0 | Negative | 100 | .. | .. | Negative | | I | Still on S.M.A. |
| | | | (b) S.M.A. on admission | | | | | | | | | | | | | | | | | | | |
| 174 | 4,150 | 5 wks. | (a) Br. + cond. milk 5 wks. | Very anemic; otherwise O.K. | 1 wk. | —200.0 | Negative | 3,950 | 6 wks. | Anemic | 75 | | 17 | 163.5 | Negative | 85 | 15 | .. | Slight; rare | | I | Still on S.M.A. |
| | | | (b) Breast 1 wk. | | | | | | | | 25 Br. | | | | | | | | | | | |
| 175 | 4,770 | 12 wks. | (a) Breast 12 wks. | Good | 4 wks. | 142.5 | Dyspepsia 1 time | 5,340 | 16 wks. | Good | 50 | | 18 | 160.0 | Negative | 100 | .. | .. | Negative | | I | Still on S.M.A. |
| | | | (b) Breast 4 wks. | | | | | | | | 50 Br. | | | | | | | | | | | |
| 176 | 4,740 | 13 wks. | (a) Breast 13 wks. | Dyspepsia 1 time | 1 wk. | 110.0 | Negative | 4,850 | 14 wks. | Fair | 50 | | 19 | 114.7 | Negative | 100 | .. | .. | Negative | | I | Still on S.M.A. |
| | | | (b) Breast 1 wk. | | | | | | | | 50 Br. | | | | | | | | | | | |
| 177 | 3,450 | 6 wks. | (a) Breast 6 wks. | Turgor fair | 1 wk. | —190.0 | Negative | 3,260 | 7 wks. | Same as on admission | 75 | | 21 | 112.8 | Dyspepsia 1 time | 95 | .. | 5 | Negative | | I | Still on S.M.A. |
| | | | (b) Breast 1 wk. | | | | | | | | 25 Br. | | | | | | | | | | | |
| 179 | 3,700 | 13 wks. | (a) Breast 13 wks. | Fair | 5 wks. | 0 | Negative | 3,700 | 18 wks. | Turgor poor | 50 | | 20 | 114.0 | Anemic | 75 | 25 | .. | Negative | | I | Still on S.M.A. |
| | | | (b) Br. + cert. milk M. 5 wks. | | | | | | | | 50 Br. | | | | | | | | | | | |
| 180 | 4,670 | 22 wks. | (a) Br. 17 wks.; then milk mod.; later Eskay's | Turgor poor; thin | 0 | S.M.A. on adm. | S.M.A. on adm. | 4,670 | 22 wks. | Same as on admission | 100 | | 21 | 165.7 | Negative | 90 | 10 | .. | Negative | | I | Age |
| | | | (b) S.M.A. on admission | | | | | | | | | | | | | | | | | | | |
| 181 | 4,800 | 27 wks. | (a) Br. 3 wks.; cond. milk 24 wks. | Thin; turgor poor; dyspepsia | 0 | S.M.A. on adm. | S.M.A. on adm. | 4,800 | 27 wks. | Same as on admission | 100 | | 16 | 141.2 | Negative | 85 | 15 | .. | Negative | | I | Indifferent |
| | | | (b) S.M.A. on admission | | | | | | | | | | | | | | | | | | | |
| 183 | 3,870 | 15 wks. | (a) Br. 6 wks.; cert. milk 9 wks. | Negative | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,870 | 15 wks. | Same as on admission | 100 | | 9 | 124.4 | Negative | 100 | .. | .. | Medium; rare | | I | Indifferent |
| | | | (b) S.M.A. on admission | | | | | | | | | | | | | | | | | | | |
| 184 | 3,300 | 15 wks. | (a) Breast 15 wks. | Turgor fair; double inguinal hernia | 2 days | —10.0 (2 days) | Constipated | 3,290 | 15 wks. | Neg. except constipated | 50 | | 19 | 199.4 | Negative | 100 | .. | .. | Negative | | I | Moved |
| | | | (b) Breast 2 days | | | | | | | | 50 Br. | | | | | | | | | | | |
| 186 | 5,780 | 10 wks. | (a) Br. + supplementary feeding 10 wks. | Good | 0 | S.M.A. on adm. | S.M.A. on adm. | 5,780 | 10 wks. | Same as on admission | 100 | | 21 | 123.3 | Negative | 25 | 75 | .. | Negative | | I | Still on S.M.A. |
| | | | (b) S.M.A. on admission | | | | | | | | | | | | | | | | | | | |
| 187 | 4,850 | 10 wks. | (a) Br. 8 wks.; Br. + Horlick's 2 wks. | Negative | 0 | S.M.A. on adm. | S.M.A. on adm. | 4,850 | 10 wks. | Same as on admission | 75 | | 18 | 165.5 | Negative | 95 | 5 | .. | Negative | | I | Still on S.M.A. |
| | | | (b) S.M.A. on admission | | | | | | | | 25 Br. | | | | | | | | | | | |
| 188 | 4,410 | 9 wks. | (a) Br. 8 wks.; Br. + cond. milk 1 wk. | Thrush; infected eyes | 0 | S.M.A. on adm. | S.M.A. on adm. | 4,410 | 9 wks. | Same as on admission | 100 | | 13 | 181.5 | Negative | 100 | .. | .. | Negative | | I | Moved |
| | | | (b) S.M.A. on admission | | | | | | | | | | | | | | | | | | | |
| 189 | 3,940 | 6 wks. | (a) Br. 1 wk.; milk mod. 5 wks. | Turgor fair | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,940 | 6 wks. | Same as on admission | 100 | | 19 | 116.3 | Negative | 100 | .. | .. | Negative | | I | By mistake |
| | | | (b) S.M.A. on admission | | | | | | | | | | | | | | | | | | | |
| 190 | 4,260 | 13 wks. | (a) Br. 4 wks.; cond. milk 9 wks. | Thrush; umbilical hernia; does not see | 0 | S.M.A. on adm. | S.M.A. on adm. | 4,260 | 13 wks. | Same as on admission | 100 | | 19 | 119.4 | Negative | 100 | .. | .. | Negative | | I | Still on S.M.A. |
| | | | (b) S.M.A. on admission | | | | | | | | | | | | | | | | | | | |
| 191 | 3,320 | 10 wks. | (a) Br. 2 wks.; Br. + milk mod. 8 wks. | Turgor good | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,320 | 10 wks. | Same as on admission | 50 | | 17 | 177.0 | Sl. eczema; better | 100 | .. | .. | Negative | | I | Still on S.M.A. |
| | | | (b) S.M.A. on admission | | | | | | | | 50 Br. | | | | | | | | | | | |
| 193 | 4,370 | 8 wks. | (a) Br. 2 wks.; Br. + milk 6 wks. | Left hydrocele; fung. umbilicus; rash on body from oil rubs; adherent foreskin; otherwise good | 2 days | —120.0 (2 days) | Same as on adm. | 4,250 | 8 wks. | Same as on admission | 75 | | 17 | 176.4 | Negative | 100 | .. | .. | Slight; rare | | I | Still on S.M.A. |
| | | | (b) Breast 2 days | | | | | | | | 25 Br. | | | | | | | | | | | |
| 194 | 2,980 | 8 wks. | (a) Breast 8 wks. | Losing weight; turgor poor | 0 | S.M.A. on adm. | S.M.A. on adm. | 2,980 | 8 wks. | Same as on admission | 75 | | 9 | 181.1 | Negative | 100 | .. | .. | Negative | | I | Moved |
| | | | (b) S.M.A. on admission | | | | | | | | 25 Br. | | | | | | | | | | | |
| 195 | 4,220 | 6 wks. | (a) Breast 6 wks. | Constipated | 2 wks. | 85.0 | Negative | 4,490 | 8 wks. | Good | 75 | | 15 | 158.6 | Bronchitis | 100 | .. | .. | Negative | | I | Still on S.M.A. |
| | | | (b) Breast 2 wks. | | | | | | | | 25 Br. | | | | | | | | | | | |
| 196 | 3,970 | 6 wks. | (a) Br. 2 wks.; then Br. at night, milk during day | Turgor poor | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,970 | 6 wks. | Same as on admission | 75 | | 16 | 89.3 | Dyspepsia 1 time | 50 | 50 | .. | Slight; rare | | I | Still on S.M.A. |
| | | | (b) S.M.A. on admission | | | | | | | | 25 Br. | | | | | | | | | | | |
| 197 | 3,350 | 10 wks. | (a) Br. 9 wks.; Br. + cond. milk 1 wk. | Turgor fair | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,350 | 10 wks. | Same as on admission | 100 | | 16 | 164.3 | Negative; anemic | 100 | .. | .. | Negative | | I | Still on S.M.A. |
| | | | (b) S.M.A. on admission | | | | | | | | | | | | | | | | | | | |
| 198 | 5,110 | 13 wks. | (a) Br.; later Br. + malted milk | Eczema on forehead | 0 | S.M.A. on adm. | S.M.A. on adm. | 5,110 | 13 wks. | Same as on admission | 75 | | 16 | 136.2 | Negative | 100 | .. | .. | Negative | | I | Still on S.M.A. |
| | | | (b) S.M.A. on admission | | | | | | | | 25 Br. | | | | | | | | | | | |
| 199 | 5,030 | 10 wks. | (a) Br. 6 wks.; Br. + cond. milk 4 wks. | Negative | 1 wk. | —50.0 | Negative | 4,980 | 11 wks. | Negative | 50 | | 7 | 132.8 | Negative | 100 | .. | .. | Slight; rare | | I | Indifferent |
| | | | (b) Breast 1 wk. | | | | | | | | 50 Br. | | | | | | | | | | | |
| 200 | 6,490 | 18 wks. | (a) Breast 18 wks. | Negative | 1 wk. | 40.0 | Negative | 6,530 | 19 wks. | Negative | 50 | | 15 | 158.0 | Negative | 100 | .. | .. | Negative | | I | Still on S.M.A. |
| | | | (b) Breast 1 wk. | | | | | | | | 50 Br. | | | | | | | | | | | |
| 202 | 3,100 | 3½ wks. | (a) Breast 3½ wks. | Negative | 3 days | 90.0 (3 days) | Negative | 3,190 | 4 wks. | Negative | 40 | | 14 | 206.4 | Dyspepsia 1 time | 75 | 15 | 10 | Negative | | I | Still on S.M.A. |
| | | | (b) Breast 3 days | | | | | | | | 60 Br. | | | | | | | | | | | |
| 203 | 3,790 | 7 wks. | (a) Br. 3 wks.; cert. milk 4 wks. | Thin; turgor fair | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,790 | 7 wks. | Same as on admission | 100 | | 15 | 166.6 | Dyspepsia 1 time | 100 | .. | .. | Slight; rare | | I | Still on S.M.A. |
| | | | (b) S.M.A. on admission | | | | | | | | | | | | | | | | | | | |
| 204 | 4,120 | 15 wks. | (a) Br. 4 wks.; Mellin's Food 11 wks. | Turgor poor | 0 | S.M.A. on adm. | S.M.A. on adm. | 4,120 | 15 wks. | Same as on admission | 100 | | 15 | 192.0 | Dyspepsia 1 time | 70 | 20 | 10 | Negative | | I | Still on S.M.A. |
| | | | (b) S.M.A. on admission | | | | | | | | | | | | | | | | | | | |
| 206 | 5,400 | 10 wks. | (a) Br. 3 wks.; milk mod. 6 wks.; cond. milk 1 wk. | Good | 0 | S.M.A. on adm. | S.M.A. on adm. | 5,400 | 10 wks. | Same as on admission | 100 | | 13 | 180.7 | Otitis media; cold | 90 | 10 | .. | Negative | | I | Still on S.M.A. |
| | | | (b) S.M.A. on admission | | | | | | | | | | | | | | | | | | | |
| 207 | 3,630 | 2½ wks. | (a) Breast 2½ wks. | Good | 2 days | —140.0 (2 days) | Losing weight | 3,490 | 2½ wks. | Same as on admission | 50 | | 12 | 193.3 | Negative | 90 | 10 | .. | Negative | | I | Still on S.M.A. |
| | | | (b) Breast 2 days | | | | | | | | 50 Br. | | | | | | | | | | | |
| 208 | 2,610 | 9 wks. | (a) Milk mod. 9 wks. | Inanition; umbilical hernia | 15 wks. | 116.0 | Dyspepsia; Slightly constipated | 4,350 | 24 wks. | Improved | 100 | | 11 | 204.5 | Negative | 65 | 35 | .. | Negative | | I | Still on S.M.A. |
| | | | (b) Elweiss 15 wks. | | | | | | | | | | | | | | | | | | | |
| 209 | 3,580 | 9 wks. | (a) Br. + Mellin's 9 wks. | Poor | 1 wk. | —30.0 | Lost Weight | 3,550 | 10 wks. | Same as on admission | 50 | | 12 | 171.0 | Dyspepsia | 50 | 25 | 25 | Negative | | I | Still on S.M.A. |
| | | | (b) Breast 1 wk. | | | | | | | | 50 Br. | | | | | | | | | | | |
| 210 | 3,510 | 5 wks. | (a) Breast 5 wks. | Good; turgor fair | 2 days | —50.0 (2 days) | Lost weight | 3,460 | 5 wks. | Same as on admission | 50 | | 11 | 221.8 | Neg. except vomiting | 90 | 10 | .. | Negative | | I | Still on S.M.A. |
| | | | (b) Breast 2 days | | | | | | | | 50 Br. | | | | | | | | | | | |
| 211 | 2,990 | 4 wks. | (a) Breast 4 wks. | Good | 1 wk. | 40.0 | Negative | 3,030 | 5 wks. | Same as on admission | 100 | | 12 | 146.6 | Negative | 70 | 30 | .. | Slight; rare | | I | Still on S.M.A. |
| | | | (b) Breast 1 wk. | | | | | | | | | | | | | | | | | | | |
| 212 | 4,040 | 9 wks. | (a) Never br.; cert. milk 9 wks. | Turgor poor | 9 wks. | S.M.A. on adm. | S.M.A. on adm. | 4,040 | 9 wks. | Same as on admission | 100 | | 12 | 171.6 | Negative | 100 | .. | .. | Negative | | I | Still on S.M.A. |
| | | | (b) S.M.A. on admission | | | | | | | | | | | | | | | | | | | |
| 302 | 4,080 | 21 wks. | (a) Br. 2 wks.; Mellin's Food 19 wks. | Anemia; poor turgor; disturbed balance | 5 wks. | 164.0 | Constipated | 4,900 | 26 wks. | Improved | 100 | | 25 | 63.6 | Negative | 60 | 20 | 20 | Slight; rare | 40 64.5<br>49 67.75 | II | Whooping cough and pneumonia; private Dr. advised against |
| | | | (b) Cert. milk + O.M.W. 5 wks. | | | | | | | | | | | | | | | | | | | |
| 304 | 4,940 | 18 wks. | (a) Br. 2 wks.; store milk 16 wks. | Good beginning rickets; underfed; exudative | 1 wk. | 80.0 | Negative | 5,020 | 19 wks. | Same as on admission | 100 | | 10 | 40.0 | Negative | 100 | .. | .. | Negative | | II | M. indifferent |
| | | | (b) Cert. milk + O.M.W. 1 wk. | | | | | | | | | | | | | | | | | | | |

* Due to wrong milk.

† Head 45 cm., chest 46 cm., girth 42 cm., length 75.66 cm., H. B. 80-70, W.B.C. 13,200, R.B.C. 5,616,000

§ Doubtful whether given adequate orange juice.

(OVER)

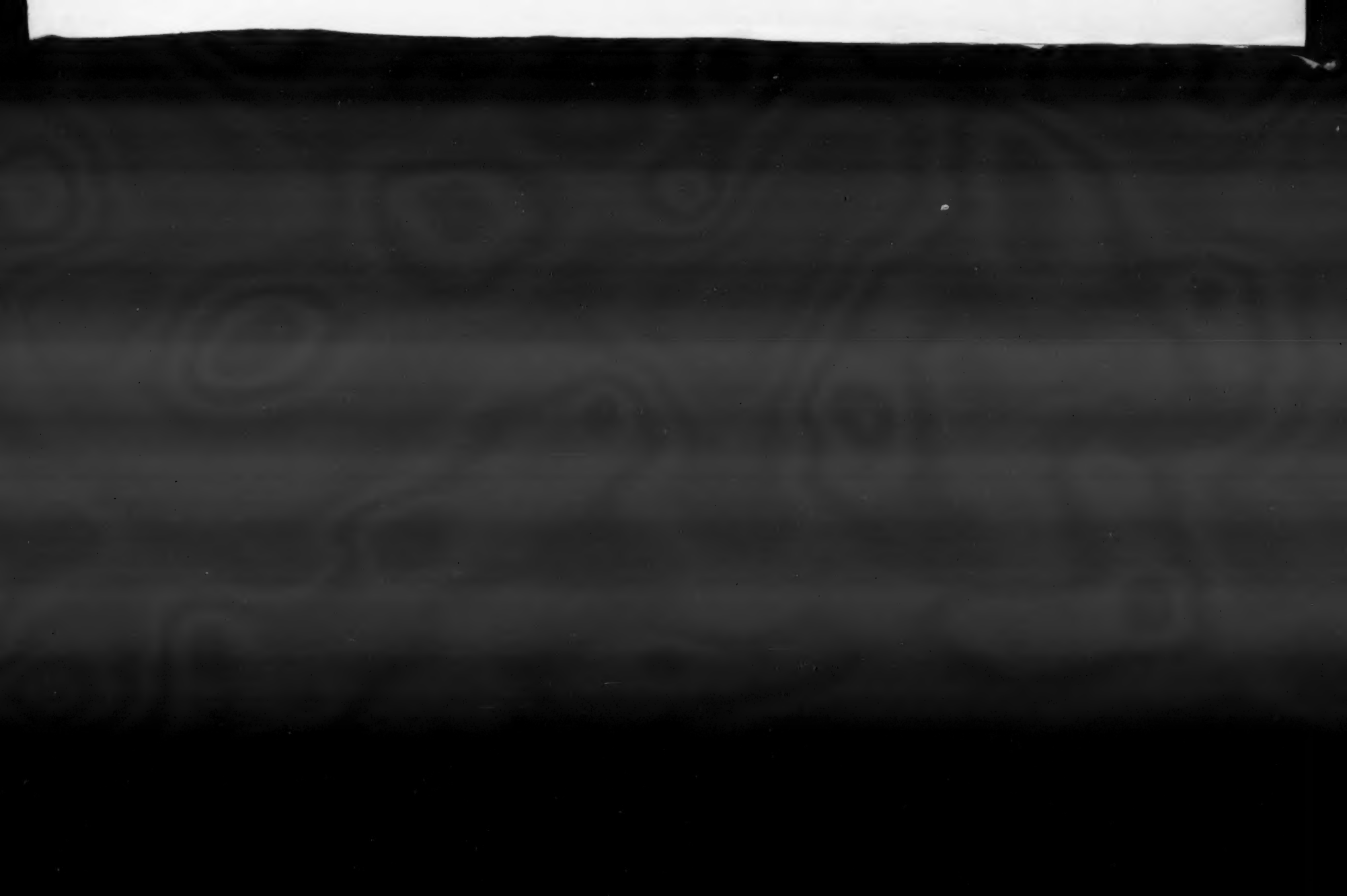
# TABLE 16—DATA OF INDIVIDUAL CASES—*Continued*

| Serial No. | Weight in Gm. and Age on Admission | Feeding (a) Previous to Admission (b) Between Admission to Disp. and S.M.A. Beginning | Physical Findings on Admission (Including Bact. or Nutr. Diseases Previous to Admission) | Time Between Adm. Date and S.M.A. Beginning | Average Weekly Gain or Loss (—) in Weight at Dispensary Previous to S.M.A. Beginning, Gm. | Bacteriologic or Nutritional Diseases Observed at Dispensary Previous to S.M.A. Beginning | Weight in Gm. and Age at S.M.A. Beginning | Physical Examination at S.M.A. Beginning | S.M.A. per Cent. | Number Weeks on S.M.A. | Average Wkly. Gain or Loss (—) in Weight While on S.M.A., Gm. | Bacteriologic or Nutritional Diseases Observed at Dispensary During Feeding with S.M.A. | Bowels on S.M.A. Normal, per Cent. | Bowels on S.M.A. Constipated, per Cent. | Bowels on S.M.A. Dyspeptic, per Cent. | Vomiting During S.M.A. | Gain in Length while on S.M.A. (Age in Weeks) Wks. Cm. | Net Result of Feeding with S.M.A. | Why Removed from S.M.A. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 305 | 3,840 8 wks. | (a) Br. 6 wks.; store milk + water 2 wks.<br>(b) Br. + cert. milk M. 2 wks. | Fair; exudative; disturbed balance | 2 wks. | 140.0 | Negative | 4,120 10 wks. | Improving | 100 | 9 | 80.0 | Negative | 60 | .. | 40 | Negative | ..... | I | Indifferent |
| 306 | 3,060 3 days | (a) Borden's 3 days<br>(b) Cert. milk M. 3 days | Good; Sl. icterus | 3 days | —80.0 (3 days) | Negative | 2,980 6 days | Same as on admission | 100 | 45 | 108.2 | Exudative | 50 | 40 | 10 | Negative | 10 56.4<br>17 61.0<br>26 64.0 | I | Age |
| 307 | 3,540 9 wks. | (a) Br. 4 wks.; Horlick's 5 wks.<br>(b) Cert. milk M. 2 wks. | Poor; disturbed balance | 2 wks. | 220.0 | Negative | 3,980 11 wks. | Improved | 100 | 6 | 50.0 | Negative | 100 | .. | .. | Negative | 6 59.5 | I | B. refuses S.M.A. |
| 312 | 4,330 5 wks. | (a) Breast 5 wks.<br>(b) Br. + cert. milk M. 7 wks. | Good | 7 wks. | 267.1 | Negative | 6,200 12 wks. | Turgor and color fine | 50<br>50 Br. | 47 | 114.5 | Negative except dyspepsia | 80 | 10 | 10 | Negative | ..... | I | Age |
| 313 | 4,460 11 wks. | (a) Breast 11 wks.<br>(b) Br. + cert. milk M. 6 wks. | Good; Sl. exudative | 6 wks. | 221.6 | Negative | 5,790 17 wks. | Turgor and color fine; few crusts on head | 50<br>50 Br. | 43 | 97.2 | Negative except dyspepsia 1 time | 80 | 10 | 10 | Negative | ..... | I | Age |
| 315 | 4,950 17 wks. | (a) Br. + Mellin's 17 wks.<br>(b) Br. + cert. milk M. 4 wks. | Good; Sl. exudative | 4 wks. | 117.5 | Negative | 5,420 20 wks. | Turgor and color fine | 50<br>50 Br. | 29 | 76.5 | Negative | 80 | 20 | .. | Negative | ..... | I | Age |
| 316 | 4,930 15 wks. | (a) Breast 15 wks.<br>(b) Br. + O.M.W. 3 wks. | Good | 3 wks. | 60.0 | Negative | 5,110 18 wks. | Stools reg.; several days ago little blood; muc. membrane red | 75<br>25 Br. | 19 | 128.9 | Negative except dyspepsia | 90 | .. | 10 | Negative | ..... | I | B. refuses to take |
| 317 | 4,140 16 wks. | (a) Milk mod. 16 wks.<br>(b) Cert. milk M. 2 wks. | Good | 2 wks. | 80.0 | Slight constipation | 4,300 18 wks. | Poorly devel.; turgor poor; general P. E. neg. | 100 | 31 | 115.4 | Negative except dyspepsia | 90 | .. | 10 | Negative | ..... | I | Moved |
| 318 | 4,730 4 wks. | (a) Br. + O.M.W. 4 wks.<br>(b) Br. + O.M.W. 6 wks. | Good; meningocele post. fontanel | 6 wks. | 111.6 | Constipation | 5,400 10 wks. | Turgor and color good | 50<br>50 Br. | 50 | 89.6 | Bronchitis; dyspepsia | 60 | .. | 40 | Slight; rare | ..... | II | Age |
| 320 | 3,430 13 wks. | (a) Breast 13 wks.<br>(b) Br. + cert. milk M. 7 wks. | Poorly nourished | 7 wks. | 250.0 | Negative | 5,180 20 wks. | Color and turgor good | 75<br>25 Br. | 7 | 68.5 | Negative | 100 | .. | .. | Negative | ..... | I | M. did not like taste of S.M.A. |
| 321 | 5,920 19 wks. | (a) Cert. milk 19 wks.<br>(b) S.M.A. on admission | Turgor fair | 0 | S.M.A. on adm. | S.M.A. on adm. | 5,920 19 wks. | Same as on admission | 75<br>25 Br. | 37 | 80.2 | Negative | 80 | 20 | .. | Negative | ..... | I | Age |
| 322 | 3,730 2 wks. | (a) Breast 2 wks.<br>(b) Br. + supp. feeding 15 wks. | Well developed; skin clear; turgor good | 15 wks. | 172.0 | Negative | 5,450 17 wks. | Turgor good | 50<br>50 Br. | 17 | 124.1 | Negative | 100 | .. | .. | Negative | ..... | I | Refused to take |
| 324 | 6,900 32 wks. | (a) Breast 32 wks.<br>(b) S.M.A. on admission | Bronchitis; adenoiditis; turgor good | 0 | S.M.A. on adm. | S.M.A. on adm. | 6,900 32 wks. | Same as on admission | 50<br>50 Br. | 39 | 70.7 | Negative | 100 | .. | .. | Negative | ..... | I | Age |
| 325 | 3,670 19 wks. | (a) Supp. feeding 19 wks.<br>(b) Cert. milk M. 4 wks. | Pale; turgor reduced; font. sunken | 4 wks. | 180.0 | Chronic dyspepsia | 3,850 23 wks. | Pale; turgor reduced; font. sunken | 100 | 19 | 83.6 | Negative | 100 | .. | .. | Negative | ..... | I | Age |
| 326 | 4,700 26 wks. | (a) Br. 13 wks.; cond. milk and Mellin's Food 13 wks.<br>(b) S.M.A. on admission | Dyspepsia; turgor poor | 0 | S.M.A. on adm. | S.M.A. on adm. | 4,700 26 wks. | Same as on admission | 75<br>25 Br. | 34 | 117.6 | Bronchitis | 95 | .. | 5 | Negative | ..... | I | Age |
| 327 | 3,200 1 wk. | (a) Cert. milk M. 1 wk.<br>(b) Cert. milk M. 1 wk. | Good; strabismus; slight icterus; turgor fair | 1 wk. | 76.0 | Negative | 3,276 2 wks. | Well devel.; turgor good | 100 | 65 | 126.0 | Constipated | 90 | 10 | .. | Medium; rare | 19 d. 52.0<br>8 56.0<br>11 59.0<br>17 60.5 | I | Age |
| 328 | 4,200 4 wks. | (a) Breast 4 wks.<br>(b) Breast 1 wk. | Exudative; constipated | 1 wk. | —120.0 | Negative | 4,080 5 wks. | Exudative; constipated | 75<br>25 Br. | 36 | 79.7 | Negative | 100 | .. | .. | Negative | ..... | I | Age |
| 329 | 4,020 8 wks. | (a) Br. 3 wks.; cond. milk 2 wks.; simple dil. 3 wks.<br>(b) Cert. milk M. 3 wks. | Exudative buttocks; catarrhal stomatitis | 3 wks. | 100.0 | Constipated | 4,320 11 wks. | Exudative | 100 | 48 | 98.3 | Negative | 45 | 50 | 5 | Negative | ..... | I | Age |
| 330 | 1,430 3 wks. | (a) Breast 3 wks.<br>(b) S.M.A. on admission | Poorly developed (twin); skin clear; turgor poor | 0 | S.M.A. on adm. | S.M.A. on adm. | 1,430 3 wks. | Same as on admission | 75<br>25 Br. | 8 | 207.5 | Negative | 100 | .. | .. | Negative | ..... | I | M. indifferent |
| 331 | 2,160 3 wks. | (a) Breast 3 wks.<br>(b) S.M.A. on admission | Skin clear; turgor fair (twin) | 0 | S.M.A. on adm. | S.M.A. on adm. | 2,160 3 wks. | Same as on admission | 75<br>25 Br. | 12 | 180.0 | Negative | 95 | 5 | .. | Negative | ..... | I | M. indifferent |
| 332 | 7,430 29 wks. | (a) Breast 29 wks.<br>(b) S.M.A. on admission | Turgor good | 0 | S.M.A. on adm. | S.M.A. on adm. | 7,430 29 wks. | Same as on admission | 75<br>25 Br. | 44 | 70.2 | Negative | 100 | .. | .. | Negative | ..... | I | Age |
| 333 | 4,050 7 wks. | (a) Breast 7 wks.<br>(b) S.M.A. on admission | Good; turgor fair; skin clear; conjunctivitis | 0 | S.M.A. on adm. | S.M.A. on adm. | 4,050 7 wks. | Same as on admission | 75<br>25 Br. | 34 | 110.8 | Cold | 100 | .. | .. | Negative | ..... | I | M. indifferent |
| 335 | 3,870 22 wks. | (a) Simple dil. 22 wks.<br>(b) S.M.A. on admission | Poor nutrition; rickets | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,870 22 wks. | Same as on admission | 100 | 25 | 99.6 | Bronchitis | 100 | .. | .. | Negative | ..... | I | Indifferent |
| 338 | 2,620 8 wks. | (a) Breast 8 wks.<br>(b) S.M.A. on admission | Negative | 0 | S.M.A. on adm. | S.M.A. on adm. | 2,620 8 wks. | Same as on admission | 75<br>25 Br. | 23 | 134.7 | Negative | 90 | .. | 10 | Medium; rare | ..... | I | M. indifferent |
| 339 | 5,010 8 wks. | (a) Breast 8 wks.<br>(b) Breast 16 wks. | Negative | 16 wks. | 73.1 | Negative | 6,180 24 wks. | Negative | 75<br>25 Br. | 9 | 78.7 | Mult. furunculosis | 100 | .. | .. | Negative | ..... | I | M. indifferent |
| 340 | 3,560 2 wks. | (a) Breast 2 wks.<br>(b) S.M.A. on admission | Negative | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,560 2 wks. | Same as on admission | 75<br>25 Br. | 22 | 131.8 | Negative | 100 | .. | .. | Negative | ..... | I | Moved |
| 341 | 2,160 5½ wks. | (a) Breast 5½ wks.<br>(b) Breast 1 wk. | Undernourished and devel. | 1 wk. | 290.0 | Same as on adm. | 2,450 6½ wks. | Turgor poor; skin clear | 75<br>25 Br. | 36 | 129.1 | Diarrhea | 90 | 5 | 5 | Negative | ..... | I | M. indifferent |
| 343 | 3,050 5 wks. | (a) Breast 5 wks.<br>(b) S.M.A. on admission | Turgor poor; skin clear | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,050 5 wks. | Same as on admission | 75<br>25 Br. | 22 | 225.0 | Negative | 100 | .. | .. | Negative | ..... | I | M. indifferent |
| 345 | 4,280 6 wks. | (a) Breast 6 wks.<br>(b) Br. + cert. milk M. 11 wks. | Well developed; Sl. crusts on scalp | 11 wks. | 190.0 | Negative | 6,370 17 wks. | Negative | 75<br>25 Br. | 29 | 142.0 | Negative | 90 | .. | 10 | Negative | ..... | I | Age |
| 346 | 2,130 4 wks. | (a) Breast 4 wks.<br>(b) Br. + cert. milk M 8 wks. | Fair; thrush; cheeks sl. roughened (twin) | 8 wks. | 250.0 | Negative | 4,130 12 wks. | Negative | 75<br>25 Br. | 25 | 103.0 | Negative | 100 | .. | .. | Negative | ..... | I | Did not return |
| 347 | 3,210 4 wks. | (a) Br. 3 days; milk mod. 3½ wks.<br>(b) Br. + cert. milk M. 8 wks. | Undernourished; thrush; cheeks roughened (twin) | 8 wks. | 123.7 | Negative | 4,200 12 wks. | Improved | 100 | 28 | 139.0 | Negative | 90 | .. | 10 | Negative | ..... | I | M. indifferent |
| 348 | 3,280 1 wk. | (a) Horlick's Milk 1 wk.<br>(b) S.M.A. on admission | Fine; skin clear; turgor fair | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,280 1 wk. | Same as on admission | 100 | 8 | 90.0 | Negative | 100 | .. | .. | Negative | ..... | I | Died (whooping cough) |
| 350 | 5,340 6 wks. | (a) Breast 6 wks.<br>(b) S.M.A. on admission | Baby O.K.; skin clear; turgor good | 0 | S.M.A. on adm. | S.M.A. on adm. | 5,340 6 wks. | Same as on admission | 75<br>25 Br. | 16 | 121.2 | Negative | 100 | .. | .. | Negative | ..... | I | Moved |
| 351 | 4,450 5 wks. | (a) Breast 5 wks.<br>(b) S.M.A. on admission | Good; turgor fair | 0 | S.M.A. on adm. | S.M.A. on adm. | 4,450 5 wks. | Same as on admission | 50<br>50 Br. | 8 | 201.0 | Negative | 100 | .. | .. | Negative | ..... | I | Private Dr. advised against |
| 352 | 2,920 14 wks. | (a) Br. 2 wks.; Mellin's Food 12 wks.<br>(b) S.M.A. on admission | Poorly nourished; turgor poor | 0 | S.M.A. on adm. | S.M.A. on adm. | 2,920 14 wks. | Same as on admission | 90<br>10 Br. | 45 | 118.4 | Negative | 95 | 5 | .. | Negative | ..... | I | Age |
| 353 | 4,920 5 wks. | (a) Breast 5 wks.<br>(b) Breast 8 wks. | Negative; turgor good | 8 wks. | 188.7 | Negative | 6,430 13 wks. | Negative | 75<br>25 Br. | 20 | 81.5 | Dyspepsia and constipation (alternate) | ... | 50 | 50 | Slight; rare | ..... | III | Dyspepsia |
| 354 | 6,580 21 wks. | (a) Br. 8 wks.; Imper. Granum 13 wks.<br>(b) S.M.A. on admission | Good; exudative | 0 | .M.A. on adm. | S.M.A. on adm. | 6,580 21 wks. | Same as on admission | 100 | 28 | 84.2 | Negative | 80 | .. | 20 | Negative | ..... | I | M. indifferent |
| 356 | 2,400 3 wks. | (a) Breast 3 wks.<br>(b) Br. + cert. milk M. 5 wks. | Good | 5 wks. | 112.0 | Negative | 2,960 8 wks. | Negative | 100 | 9 | 183.3 | Negative | 100 | .. | .. | Negative | ..... | I | Private Dr. advised against |
| 357 | 5,000 12 wks. | (a) Br. + cond. milk 12 wks.<br>(b) S.M.A. on admission | Good | 0 | S.M.A. on adm. | S.M.A. on adm. | 5,000 12 wks. | Same as on admission | 75<br>25 Br. | 7 | 160.0 | Negative | 100 | .. | .. | Slight; rare | ..... | I | Did not return |
| 358 | 3,100 5 wks. | (a) Breast 5 wks.<br>(b) Breast 10 wks. | Good | 10 wks. | 104.0 | Negative | 4,140 14 wks. | Negative | 75<br>25 Br. | 6 | 1.6 | Dyspepsia | 50 | .. | 50 | Slight; rare | ..... | III | Moved |
| 359 | 6,400 24 wks. | (a) Breast 24 wks.<br>(b) S.M.A. on admission | Good; skin clear | 0 | S.M.A. on adm. | S.M.A. on adm. | 6,400 24 wks. | Same as on admission | 75<br>25 Br. | 8 | 56.2 | Dyspepsia | 80 | .. | 20 | Negative | ..... | II | Sufficient breast milk |
| 360 | 6,400 25 wks. | (a) Breast 25 wks.<br>(b) S.M.A. on admission | Neg. except adenoids and enlarged cerv. glands | 0 | S.M.A. on adm. | S.M.A. on adm. | 6,400 25 wks. | Same as on admission | 100 | 8 | 56.2 | Negative | 100 | .. | .. | Negative | ..... | I | Sufficient breast milk |
| 362 | 5,200 35 wks. | (a) Horlick's 35 wks.<br>(b) S.M.A. on admission | Negative | 0 | S.M.A. on adm. | S.M.A. on adm. | 5,200 35 wks. | Same as on admission | 100 | 15 | 154.6 | Bronchitis | 70 | 20 | 10 | Negative | ..... | I | M. indifferent |
| 364 | 5,100 28 wks. | (a) Cond. milk 28 wks.<br>(b) S.M.A. on admission | Poor nutrition; anemia | 0 | S.M.A. on adm. | S.M.A. on adm. | 5,100 28 wks. | Same as on admission | 100 | 7 | 164.2 | Negative | 80 | 10 | 10 | Negative | ..... | I | M. indifferent |
| 365 | 5,100 13 wks. | (a) Breast 13 wks.<br>(b) S.M.A. on admission | Good; dyspepsia | 0 | S.M.A. on adm. | S.M.A. on adm. | 5,100 13 wks. | Same as on admission | 75<br>25 Br. | 6 | 235.0 | Negative | 50 | 50 | .. | Negative | ..... | I | Did not return |
| 366 | 4,730 17 wks. | (a) Breast 17 wks.<br>(b) Breast 4 wks. | Good; turgor fair | 4 wks. | 30.0 | Negative | 4,850 21 wks. | Same as on admission | 75<br>25 Br. | 23 | 240.8 | Otitis media; rhinitis | 100 | .. | .. | Negative | ..... | I | Still on S.M.A. |
| 367 | 4,890 7 wks. | (a) Breast 7 wks.<br>(b) S.M.A. on admission | Good; turgor fair | 0 | S.M.A. on adm. | S.M.A. on adm. | 4,890 7 wks. | Same as on admission | 75<br>25 Br. | 32 | 127.6 | Negative | 80 | 20 | .. | Negative | ..... | I | Still on S.M.A. |
| 368 | 4,450 5 wks. | (a) Breast 5 wks.<br>(b) Breast 11 wks. | Good | 11 wks. | 119.0 | Negative | 5,760 16 wks. | Good | 75<br>25 Br. | 18 | 103.8 | Bronchitis almost all the time | ... | 100 | .. | Negative | ..... | I | B. refuses to take |
| 369 | 4,030 5 wks. | (a) Breast 5 wks.<br>(b) Breast 2 wks. | Negative | 2 wks. | 0 | Not gaining | 4,030 7 wks. | Negative | 50<br>50 Br. | 23 | 208.6 | Negative | 80 | 20 | .. | Negative | ..... | I | B. refuses to take |
| 370 | 4,030 13 wks. | (a) Simple dil. 13 wks.<br>(b) S.M.A. on admission | Turgor poor | 0 | S.M.A. on adm. | S.M.A. on adm. | 4,030 13 wks. | Same as on admission | 75<br>25 Br. | 31 | 190.0 | Negative | 100 | .. | .. | Negative | ..... | I | Still on S.M.A. |
| 374 | 3,180 6 wks. | (a) Br. + supp. feeding 6 wks.<br>(b) S.M.A. on admission | Good | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,180 6 wks. | Same as on admission | 75<br>25 Br. | 32 | 175.0 | Sl. dyspepsia | 70 | 30 | .. | Slight; rare | ..... | II | B. refuses to take |
| 375 | 3,650 2 wks. | (a) Breast 2 wks.<br>(b) Breast 5 wks. | Good; dyspepsia | 5 wks. | —110.0 | Negative | 3,100 7 wks. | Negative | 75<br>25 Br. | 26 | 166.5 | Dyspepsia and constipation (alternate) | 60 | 20 | 20 | Slight; rare | ..... | I | B. refuses to take |
| 376 | 3,900 8 wks. | (a) Breast 8 wks.<br>(b) Br. + cert. milk M. 12 wks. | Negative | 12 wks. | 175.0 | Negative | 6,000 20 wks. | Good | 75<br>25 Br. | 18 | 194.4 | Negative | 100 | .. | .. | Negative | ..... | I | Still on S.M.A. |
| 378 | 6,850 51 wks. | (a) Milk mod.<br>(b) Milk mod. 8 wks. | Negative | 8 wks. | 123.7 | Negative | 7,840 59 wks. | Negative | 100 | 7 | 274.2 | Negative | 100 | .. | .. | Negative | ..... | I | Age |
| 379 | 3,540 3 wks. | (a) Milk mod. 3 wks.<br>(b) S.M.A. on admission | Negative | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,540 3 wks. | Negative | 100 | 6 | 43.3 | Negative | 100 | .. | .. | Negative | ..... | I | M. indifferent |
| 381 | 4,330 6 wks. | (a) Br. + barley water 6 wks.<br>(b) S.M.A. on admission | Good | 0 | S.M.A. on adm. | S.M.A. on adm. | 4,330 6 wks. | Good | 75<br>25 Br. | 23 | 196.9 | Exudative (bad) | 100 | .. | .. | Negative | ..... | I | Sufficient breast milk |
| 382 | 3,400 4 wks. | (a) Breast 4 wks.<br>(b) Breast 9 wks. | Negative except pertussis | 9 wks. | —5.5 | Intertrigo; pertussis | 3,350 13 wks. | Recovering from pertussis and intertrigo | 75<br>25 Br. | 17 | 120.5 | Cough following pertussis; furunculosis | 100 | .. | .. | Negative | ..... | II | M. indifferent |
| 383 | 3,990 6 wks. | (a) Breast 6 wks.<br>(b) S.M.A. on admission | Good | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,990 6 wks. | Same as on admission | 75<br>25 Br. | 26 | 117.6 | Negative | 100 | .. | .. | Negative | ..... | I | B. refuses to take |
| 384 | 3,360 4 wks. | (a) Breast 4 wks.<br>(b) S.M.A. on admission | Skin pale; turgor poor | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,360 4 wks. | Same as on admission | 75<br>25 Br. | 10 | 99.0 | Negative | 100 | .. | .. | Negative | ..... | I | Sufficient breast milk |
| 386 | 4,970 14 wks. | (a) Br.; then simple dil. 14 wks.<br>(b) S.M.A. on admission | Exudative; turgor poor | 0 | S.M.A. on adm. | S.M.A. on adm. | 4,970 14 wks. | Same as on admission | 100 | 25 | 116.0 | Negative | 90 | .. | 10 | Negative | ..... | I | Still on S.M.A. |
| 387 | 4,830 7 wks. | (a) Breast 7 wks.<br>(b) Breast 2 wks. | Negative; turgor good | 0 | 0 | Negative | 4,830 9 wks. | Negative | 50<br>50 Br. | 14 | 40.7 | Dyspepsia | 20 | 60 | 20 | Slight; rare | ..... | I | M. indifferent |
| 389 | 3,810 10 days | (a) Milk mod. 10 days<br>(b) Cert. milk M., 6 wks. | Fracture of right femur; umb. hernia | 6 wks. | 41.6 | Negative | 4,060 7 wks. | Same as on admission | 100 | 7 | 137.0 | Negative | 100 | .. | .. | Negative | ..... | I | M. indifferent |
| 390 | 3,370 13 wks. | (a) Breast 13 wks.<br>(b) S.M.A. on admission | Good; constipated | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,370 13 wks. | Same as on admission | 75<br>25 Br. | 20 | 122.5 | Negative | 40 | 60 | .. | Slight; rare | ..... | I | Still on S.M.A. |
| 392 | 3,960 13 wks. | (a) Cond. milk 13 wks. | Good; turgor fair | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,960 13 wks. | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | (b) S.M.A. on admission | | | | | | | | | | | | | | | | | | | | | | |
| 374 | 3,180 | 6 wks. | (a) Br. + supp. feeding 6 wks. ...<br>(b) S.M.A. on admission | Good | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,180 | 6 wks. | Same as on admission | 75<br>25 Br. | 22 | 170.0 | Sl. dyspepsia | 70 | 30 | .. | Slight; rare | ..... | I | B. refuses to take |
| 375 | 3,650 | 2 wks. | (a) Breast 2 wks. .....<br>(b) Breast 5 wks. | Good; dyspepsia | 5 wks. | —110.0 | Negative | 3,100 | 7 wks. | Negative | 75<br>25 Br. | 26 | 166.5 | Dyspepsia and constipation (alternate) | 60 | 20 | 20 | Slight; rare | ..... | I | B. refuses to take |
| 376 | 3,900 | 8 wks. | (a) Breast 8 wks. .....<br>(b) Br. + cert. milk M. 12 wks. | Negative | 12 wks. | 175.0 | Negative | 6,000 | 20 wks. | Good | 75<br>25 Br. | 18 | 194.4 | Negative | 100 | .. | .. | Negative | ..... | I | Still on S.M.A. |
| 378 | 6,850 | 51 wks. | (a) Milk mod. .....<br>(b) Milk mod. 8 wks. | Negative | 8 wks. | 123.7 | Negative | 7,840 | 59 wks. | Negative | 100 | 7 | 274.2 | Negative | 100 | .. | .. | Negative | ..... | I | Age |
| 379 | 3,540 | 3 wks. | (a) Milk mod. 3 wks. .....<br>(b) S.M.A. on admission | Negative | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,540 | 3 wks. | Negative | 100 | 6 | 43.3 | Negative | 100 | .. | .. | Negative | ..... | I | M. indifferent |
| 381 | 4,330 | 6 wks. | (a) Br. + barley water 6 wks. ....<br>(b) S.M.A. on admission | Good | 0 | S.M.A. on adm. | S.M.A. on adm. | 4,330 | 6 wks. | Good | 75<br>25 Br. | 23 | 196.9 | Exudative (bad) | 100 | .. | .. | Negative | ..... | I | Sufficient breast milk |
| 382 | 3,400 | 4 wks. | (a) Breast 4 wks. .....<br>(b) Breast 9 wks. | Negative except pertussis | 9 wks. | —5.5 | Intertrigo; pertussis | 3,350 | 13 wks. | Recovering from pertussis and intertrigo | 75<br>25 Br. | 17 | 120.5 | Cough following pertussis; furunculosis | 100 | .. | .. | Negative | ..... | II | M. indifferent |
| 383 | 3,990 | 6 wks. | (a) Breast 6 wks. .....<br>(b) S.M.A. on admission | Good | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,990 | 6 wks. | Same as on admission | 75<br>25 Br. | 26 | 117.6 | Negative | 100 | .. | .. | Negative | ..... | I | B. refuses to take |
| 384 | 3,360 | 4 wks. | (a) Breast 4 wks. .....<br>(b) S.M.A. on admission | Skin pale; turgor poor | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,360 | 4 wks. | Same as on admission | 75<br>25 Br. | 10 | 99.0 | Negative | 100 | .. | .. | Negative | ..... | I | Sufficient breast milk |
| 386 | 4,970 | 14 wks. | (a) Br.; then simple dil. 14 wks. ..<br>(b) S.M.A. on admission | Exudative; turgor good | 0 | S.M.A. on adm. | S.M.A. on adm. | 4,970 | 14 wks. | Same as on admission | 100 | 25 | 116.0 | Negative | 90 | .. | 10 | Negative | ..... | I | Still on S.M.A. |
| 387 | 4,830 | 7 wks. | (a) Breast 7 wks. .....<br>(b) Breast 2 wks. | Negative; turgor good | 0 | 0 | Negative | 4,830 | 9 wks. | Negative | 50<br>50 Br. | 14 | 40.7 | Dyspepsia | 20 | 60 | 20 | Slight; rare | ..... | I | M. indifferent |
| 389 | 3,810 | 10 days | (a) Milk mod. 10 days.....<br>(b) Cert. milk M., 6 wks. | Fracture of right femur; umb. hernia | 6 wks. | 41.6 | Negative | 4,060 | 7 wks. | Same as on admission | 100 | 7 | 137.0 | Negative | 100 | .. | .. | Negative | ..... | I | M. indifferent |
| 390 | 3,370 | 13 wks. | (a) Breast 13 wks. .....<br>(b) S.M.A. on admission | Good; constipated | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,370 | 13 wks. | Same as on admission | 75<br>25 Br. | 20 | 122.5 | Negative | 40 | 60 | .. | Slight; rare | ..... | I | Still on S.M.A. |
| 392 | 3,990 | 13 wks. | (a) Cond. milk 13 wks. .....<br>(b) S.M.A. on admission | Good; turgor fair | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,990 | 13 wks. | Same as on admission | 100 | 19 | 124.2 | Otitis media | 100 | .. | .. | Negative | ..... | I | Moved |
| 393 | 4,230 | 15 wks. | (a) Br. + supp. feeding 15 wks. ..<br>(b) S.M.A. on admission | Good turgor; exudative | 0 | S.M.A. on adm. | S.M.A. on adm. | 4,230 | 15 wks. | Same as on admission | 75<br>25 Br. | 18 | 235.0 | Dyspepsia and constipated | 80 | 10 | 10 | Negative | ..... | I | Still on S.M.A. |
| 394 | 3,170 | 4 wks. | (a) Cond. milk 4 wks. .....<br>(b) S.M.A. on admission | Polypus; umbilicus | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,170 | 4 wks. | Same as on admission | 100 | 12 | 174.5 | Negative | 90 | 10 | .. | Negative | ..... | I | Moved |
| 608 | 3,300 | 13 wks. | (a) Simple dil. 3 wks. .....<br>(b) Cert. milk M.; then casein 8 wks. | Diarrhea; vomiting; ulcerative stomatitis | 8 wks. | 65.0 | Pylorospasm | 3,830 | 21 wks. | Fair devel.; poor nutr.; considerable pallor; decreased turgor; abd. protruding | 100 | 33 | 133.3 | Pylorospasm; coryza; laryngitis; otitis media | 100 | .. | .. | Medium; freq. | 45 63.25 | I | Age |
| 609 | 5,210 | 10 wks. | (a) Breast 10 wks. .....<br>(b) Br. + cert. milk M. 8 wks. | Normal prophylactic | 8 wks. | 20.0 | Vomiting and cough | 5,230 | 18 wks. | Well devel. and nour.; bright, active | 100 | 23 | 125.2 | Negative | 100 | .. | .. | Negative | ..... | I | Indifferent |
| 611 | 3,950 | 11 wks. | (a) Br. 3 wks.; malted milk 10½ wks.<br>(b) G-R No. 2 for 13 wks. | Dyspepsia | 13 wks. | 88.4 | Dyspepsia | 5,100 | 24 wks. | Fair turgor; slightly decreased | 100 | 25 | 149.2 | Bronchopneumonia | 100 | .. | .. | Negative | 33 65.5<br>48 68.75 | I | Age |
| 612 | 2,570 | 14 wks. | (a) Br. 4 wks.; Horlick's, Mellin's 5 wks.; cert. milk M. 5 wks.<br>(b) Casein 2 wks. | Disturbed balance; fairly well devel.; turgor and nutr. poor | 2 wks. | 305.0 | Decomposition | 3,180 | 16 wks. | Small; poorly devel. and nour.; decreased turgor; pale | 100 | 31 | 123.8 | Negative | 100 | .. | .. | Negative | 36 62.5<br>48 65.5 | I | Age |
| 617 | 2,550 | 3 days | (a) Breast 3 days .....<br>(b) Breast 2 wks. | Turgor fair; skin sl. yellow | 2 wks. | —25.0 | Stools thin, green, slimy; considerable vomiting | 2,500 | 2½ wks. | Well devel.; fair nutr. and turgor; good color | 100 | 38 | 104.4 | Acute otitis media; sl. conjunctiv.; poor appetite for 2 wks. | 100 | .. | .. | Slight; rare | 30 55.25<br>40 64.75 | I | Age |
| 619 | 2,750 | 16 wks. | (a) Br. 6 wks.; simple dil. and malted milk 9 wks.; cert. milk M. 1 wk.<br>(b) S.M.A. on admission | Devel. and nutr. poor; turgor decreased; square bead; snuffles since 2 wks. old; rash; umb. hernia | 0 | S.M.A. on adm. | S.M.A. on adm. | 2,750 | 16 wks. | Wassermann ++++; diag., lues | 100 | 11 | 155.4 | Negative | 90 | 10 | .. | Negative | 24 60.0 | I | Indifferent |
| 622 | 3,450 | 6 wks. | (a) Simple dil. 6 wks. .....<br>(b) S.M.A. on admission | Good turgor; well devel. and nour.; hydrocele and small umb. hernia | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,040 | 6 wks. | Same as on admission | 100 | 44 | 104.7 | Dyspepsia; bronchitis | 90 | .. | 10 | Slight; rare | 7 55.0<br>26 65.4<br>32 66.0 | I | Age |
| 623 | 3,340 | 4 wks. | (a) Simple dil. 4 wks. .....<br>(b) S.M.A. on admission | Well devel. and nour.; skin red and scaly; exudative | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,340 | 4 wks. | Same as on admission | 100 | 44 | 31.3 | Catarrhal otitis media; acute otitis media 2 times; intoxication | 95 | .. | 5 | Slight; freq. | 5 51.75<br>19 60.0<br>32 62.0 | III | Died; intoxication; home cond. bad |
| 624 | 5,380 | 10 wks. | (a) Simple dil. 10 wks. .....<br>(b) Cert. milk M. 2 wks. | Good; eczema of buttocks | 2 wks. | 25.0 | Stools thin, green, mucus for 9 days | 5,430 | 12 wks. | Good; sl. reduced turgor | 100 | 41 | 97.5 | Acute rhinitis; dyspepsia; (parenteral) ac. otitis media; sl. conjunct.; dyspepsia | 95 | .. | 5 | Negative | 11 62.0<br>29 70.0<br>34 71.0<br>49 76.0<br>53 78.25 | I | Age |
| 625 | 3,800 | 3 wks. | (a) Br. + simple dil. 3 wks. .....<br>(b) S.M.A. on admission | Good | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,800 | 3 wks. | Same as on admission | 100 | 42 | 95.0 | Bronchitis; rhinitis | 100 | .. | .. | Slight; rare | ..... | I | M. indifferent |
| 626 | 1,520 | 4 wks. | (a) Br. + sugar water 4 wks. ....<br>(b) Cert. milk M. 5 wks. | Premature; well devel.; poorly nour. | 5 wks. | 108.0 | Negative | 2,660 | 9 wks. | Small; poorly nour.; poor turgor and color | 100 | 43 | 136.0 | Negative | 90 | .. | 10 | Slight; rare | 9 46.5<br>20 56.5<br>27 58.5 | I | Age |
| 627 | 3,160 | 10 wks. | (a) Br. 2 wks.; supp. 8 wks. .....<br>(b) S.M.A. on admission | Poorly devel. and nour.; poor turgor; evident loss in wt.; pharynx inj.; gen. enlargement of glands; intertrigo left ear | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,160 | 10 wks. | Same as on admission | 100 | 39 | 67.1 | Aphthous stomatitis; ulcerative stomatitis; dyspep.; ac. otitis; ac. rhinitis; adenoiditis; ac. pharyngitis | 75 | .. | 25 | Negative | 10 54.0<br>24 60.0<br>30 61.0<br>42 68.75<br>51 68.75 | III | Age |
| 628 | 3,320 | 3 wks. | (a) Breast 3 wks. .....<br>(b) Br. + cert. milk M. 11 wks. | Well devel. and nour.; pemphigus neonatorum | 11 wks. | 7.1 | Positive von Pirquet; impetigo bullous | 3,420 | 14 wks. | Poor nutr.; fair devel.; pale; turgor decreased; active, bright | 100 | 34 | 114.6 | Neg. except stationary wt. for 10 wks. | 90 | .. | 10 | Negative | 18 57.75<br>21 58.75<br>34 64.25<br>44 65.5 | II | Age |
| 630 | 2,490 | 14 wks. | (a) Br. 1 wk.; simple dil. 4 wks.; G-R at City Hosp. 9 wks.<br>(b) S.M.A. on adm. to disp. | Negative | 0 | S.M.A. on adm. | S.M.A. on adm. | 2,490 | 4 wks. | Same as on admission | 100 | 45 | 110.4 | Negative | 100 | .. | .. | Negative | 13 51.5<br>22 55.2<br>31 60.25 | I | Age |
| 631 | 2,820 | 4 wks. | (a) Br. 3 wks.; simple dil. 1 wk. ..<br>(b) Cert. milk M. 1 wk. | Fair; glands enlarged | 1 wk. | 40.0 | Constipated; turgor fair; color good; poor nutrition | 3,460 | 5 wks. | Same as on admission | 100 | 25 | 78.0 | Rhinitis; dyspepsia; poor care | 90 | .. | 10 | Negative | 6 51.0<br>22 58.25 | I (considering poor care) | Indifferent |
| 632 | 2,820 | 2 wks. | (a) Breast 2 wks. .....<br>(b) S.M.A. on admission | Well devel. and nour.; skin clear; turgor good | 0 | S.M.A. on adm. | S.M.A. on adm. | 2,820 | 2 wks. | Same as on admission | 100 | 48 | 138.9 | Negative | 25 | 75 | .. | Negative | 3 51.0<br>9 55.25<br>18 58.5<br>23 64.0<br>30 66.5 | I | Age |
| 633 | 3,320 | 11 wks. | (a) Simple dil. + patent food 11 wks.<br>(b) S.M.A. on admission | Underfed | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,320 | 11 wks. | Same as on admission | 100 | 31 | 110.3 | Negative | 90 | 10 | .. | Medium; rare | 11 56.25<br>18 59.75<br>22 62.5<br>30 66.75<br>37 67.0<br>42 70.0 | I | Trouble with delivery of S.M.A. |
| 634 | 4,280 | 36 wks. | (a) Br. 3 wks.; patent food 33 wks.<br>(b) S.M.A. on admission | Disturbed balance; acute rhinitis | 0 | S.M.A. on adm. | S.M.A. on adm. | 4,280 | 36 wks. | Same as on admission | 100 | 25 | 130.8 | Negative | 100 | .. | .. | Slight; rare | 36 62.5<br>45 63.0<br>51 67.0<br>55 69.0 | I | Trans. to non-S.M.A. disp. |
| 635 | 4,800 | 10 wks. | (a) Br. 4 wks.; cond. milk 6 wks.<br>(b) Cert. milk M. 1 wk. | Disturbed balance | 1 wk. | 200.0 | Dyspepsia | 5,000 | 11 wks. | Same as on admission | 100 | 20 | 95.0 | Sl. rosary; umb. hernia | 50 | 30 | 20 | Medium; rare | ..... | II | Moved |
| 636 | 2,260 | 10 wks. | (a) Breast 10 wks. .....<br>(b) Br. + cert. milk M. 7 wks. | Umbilical hernia; underfeeding (twin) | 7 wks. | 77.1 | Inguinal hernia; intertrigo | 2,800 | 17 wks. | Improved | 100 | 29 | 108.3 | Pharyngitis; bronchitis; otitis media; bronchopneumonia | 90 | .. | 10 | Negative | 29 57.75 | II | Moved |
| 637 | 2,500 | 10 wks. | (a) Breast 10 wks. .....<br>(b) Br. + cert. milk M. 7 wks. | Left inguinal hernia; underfeeding; thrush (twin) | 7 wks. | 67.1 | Negative | 2,970 | 17 wks. | Improved | 100 | 29 | 122.4 | Otitis media 2 times; rhinitis; pale | 100 | .. | .. | Negative | 29 58.75<br>44 67.0 | II | Moved |
| 638 | 2,770 | 1 day | (a) Negative .....<br>(b) S.M.A. on admission | Negative | 0 | S.M.A. on adm. | S.M.A. on adm. | 2,770 | 1 day | Same as on admission | 100 | 13 | 100.7 | Negative | 95 | .. | 5 | Slight; rare | 4 52.0<br>7 53.0<br>9 54.0 | I | M. indifferent |
| 639 | 3,520 | 3 wks. | (a) Br. 2 wks.; simple dil. 1 wk.<br>(b) Oatmeal water 1 day | Dyspepsia and conjunctivitis | 1 day | —110.0 | Negative | 3,410 | 3 wks. | Same as on admission | 100 | 51 | 110.9 | Rhinitis | 95 | .. | 5 | Negative | 8 58.0<br>17 64.0<br>26 65.5<br>54† | I | Age |
| 640 | 2,750 | 9 days | (a) Simple dil. 9 days.....<br>(b) S.M.A. on admission | Weakling; exudative; umbilical hernia | 0 | S.M.A. on adm. | S.M.A. on adm. | 2,750 | 9 days | Same as on admission | 100 | 20 | 42.0 | Bronchitis; otitis media | 25 | .. | 75 | Medium; freq. | 4 54.0<br>14 57.5 | III | Sent to City Hosp. (ac. otitis, bronchitis) |
| 641 | 2,630 | 4 wks. | (a) Br. + malted milk 4 wks. ....<br>(b) Br. + casein 11 wks. | Pedatrophy; lactation; neonatorum | 11 wks. | 20.9 | Double inguinal hernia | 2,860 | 15 wks. | Premature; weakling | 100 | 31 | 163.8 | Otitis media; coryza; intertrigo; exudative | 75 | .. | 25 | Slight; rare | ..... | I | Died (follicular enteritis) |
| 642 | 3,890 | 4 wks. | (a) Simple dil. 4 wks. .....<br>(b) S.M.A. on admission | Exud. diathesis; rhinitis | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,890 | 4 wks. | Same as on admission | 100 | 29 | 47.9 | Intertrigo; bronchopneum.; home cond. very bad | 100 | .. | .. | Negative | 4 48.0<br>10 57.75<br>13 61.0 | II (home cond. bad) | Died (diarrhea and enteritis) |
| 643 | 3,000 | 11 wks. | (a) Simple dil. 11 wks. .....<br>(b) Cert. milk M. 1 wk. | Negative | 1 wk. | —200.0 | B. looks poorly | 2,800 | 12 wks. | B. looks poorly | 100 | 33 | 153.9 | Otitis media | 100 | .. | .. | Negative | ..... | I | Moved |
| 645 | 2,950 | 4 wks. | (a) Simple dil 4 wks. .....<br>(b) Cert. milk M. 2 days | Thrush; otherwise neg. | 2 days | 50.0<br>(for 2 days) | Negative | 3,000 | 4 wks. | Same as on admission | 100 | 37 | 132.9 | Rhinitis; otitis media; bronchopneumonia | 100 | .. | .. | Negative | ..... | I | Age |
| 647 | 3,230 | 12 days | (a) ?<br>(b) S.M.A. on admission | Negative | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,230 | 12 days | Same as on admission | 100 | 12 | 86.6 | Negative | 100 | .. | .. | Slight; rare | ..... | II§ | Still on S.M.A |
| 648 | 3,320 | 11 days | (a) Br. 9 days; sugar water + milk 2 days<br>(b) S.M.A. on admission | Negative | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,320 | 11 days | Same as on admission | 100 | 8 | 177.5 | Negative | 50 | 50 | .. | Slight; freq. | ..... | I | Still on S.M.A. |
| 649 | 4,493 | 13 wks. | (a) ?<br>(b) Casein + carbohydr. from 4 to 8% | Harelip; undernourished | 14 wks. | — 47.0 | Dyspepsia; otitis media; bronchitis | 3,835 | 27 wks. | Disturbed balance; Harelip | 100 | 19 | 135.0 | Negative | 50 | 50 | .. | Negative | ..... | I | Still on S.M.A. |
| 650 | 2,700 | 8 wks. | (a) ?<br>(b) Casein + carbohydr. from 4 to 10% | Harelip; undernourished | 20 wks. | 17.5 | Dyspepsia; furuncle on leg | 3,050 | 28 wks. | Disturbed balance; Harelip | 100 | 17 | 153.0 | Negative | 50 | 50 | .. | Negative | ..... | I | Still on S.M.A. |
| 703 | 4,410 | 14 wks. | (a) Breast 14 wks. .....<br>(b) Breast 16 wks. | Negative | 16 wks. | 102.5 | Slight regurgitation | 6,050 | 30 wks. | Good | 100 | 21 | 78.0 | Anemia; constipation | 80 | 20 | .. | Slight; rare | ..... | II | B. refuses to take |
| 705 | 3,250 | 7 wks. | (a) Breast 7 wks. .....<br>(b) Br. + cert. milk M. 11 wks. | Underfed | 11 wks. | 168.1 | Exudative | 5,100 | 18 wks. | Fairly good | 100 | 37 | 168.5 | Infected arm; sup. adenitis; bronchitis; otitis | 90 | 10 | .. | Negative | ..... | I | Age |
| 708 | 3,460 | 13 wks. | (a) Br. 2-3 wks.; cert. milk mod. 10-11 wks.<br>(b) Br. + cert. milk M. 2 wks. | Fairly good; umbilical hernia (twin) | 2 wks. | 170.0 | Negative | 3,800 | 15 wks. | Good | 75<br>25 Br. | 61 | 90.1 | Dyspepsia 2 times; ac. bronchitis; pyelocystitis | 80 | .. | 20 | Slight; rare | 34 60.5<br>49 66.0 | III | Age |
| 709 | 4,000 | 13 wks. | (a) Br. 2-3 wks.; then supp. feed.; then Br. + cert. milk M.<br>(b) Br. + cert. milk M. 2 wks. | Good (twin) | 2 wks. | 105.0 | Negative | 4,210 | 15 wks. | Good | 75<br>25 Br. | 61 | 105.7 | Negative | 90 | 10 | .. | Slight; rare | 32 65.0<br>45 68.75<br>49 70.0 | I | Age |
| 710 | 2,800 | 9 wks. | (a) Supp. feeding 9 wks. .....<br>(b) S.M.A. on admission | Seborrhea of scalp; pedatrophy; large ant. fontanel | 0 | S.M.A. on adm. | S.M.A. on adm. | 2,800 | 9 wks. | Same as on admission | 100 | 47 | 145.7 | Negative | 65 | 35 | .. | Medium; rare | 30½ 66.5<br>39 69.0<br>42 71.0 | I | Age |
| 711 | 3,000 | 4 wks. | (a) Milk mod. 4 wks. .....<br>(b) S.M.A. on admission | Exudative; pedatrophy; eczema on buttocks; cesarean section | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,000 | 4 wks. | Same as on admission | 100 | 21 | 137.1 | Pneumonia; eczema on face | 80 | 20 | .. | Slight; rare | 13 58.1<br>17 60.5 | I | Irreg. delivery |
| 712 | 4,720 | 5 wks. | (a) Br. 1 wk.; cond. milk 2 wks.; wet nurse + cert. milk M. 2 wks.<br>(b) S.M.A. on admission | Constipation; vomiting; underfed; seborrhea of scalp | 0 | S.M.A. on adm. | S.M.A. on adm. | 4,720 | 5 wks. | Same as on admission | 100 | 26 | 133.8 | Sl. eczema on face; sl. seborrhea of scalp | 90 | 10 | .. | Slight; rare | 12 61.0<br>23 65.25 | I | Irreg. delivery |
| 713 | 5,420 | 6 wks. | (a) Cert. milk M. 6 wks. .....<br>(b) Cert. milk M. 1 wk. | Constipation | 1 wk. | 180.0<br>(for 9 days) | Negative | 5,000 | 7 wks. | Same as on admission | 100 | 10 | 170.0 | Negative | 80 | 20 | .. | Negative | 12 60.0 | I | Moved |
| 714 | 2,980 | 10 wks. | (a) Br. + Horlick's 10 wks. .....<br>(b) Cert. milk M. 1 wk. | Well devel.; poorly nour.; lt. inguinal hernia; der- | 1 wk. | 0 | Negative | 2,980 | 11 wks. | Same as on admission | 100 | 43 | 114.1 | Sto atitis; seborrhea of scalp | 90 | .. | 10* | Slight; rare | 22 58.75 | I | Age |

| | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | (b) Casein + carbohydr. from 4 to 8% | | | | Dyspepsia; otitis media; bronchitis | | | Harelip | | | | | | | | | | | | | | | |
| 650 | 2,700 | 8 wks. | (a) ? ..... (b) Casein + carbohydr. from 4 to 10% | Harelip; undernourished..... | 20 wks. | 17.5 | Dyspepsia; furuncle on leg | 3,050 | 28 wks. | Disturbed balance; Harelip | 100 | 17 | 153.0 | Negative | 50 | 50 | .. | Negative | ..... | I | Still on S.M.A. |
| 703 | 4,410 | 14 wks. | (a) Breast 14 wks. ..... (b) Breast 16 wks. | Negative..... | 16 wks. | 102.5 | Slight regurgitation | 6,050 | 30 wks. | Good | 100 | 21 | 78.0 | Anemia; constipation | 80 | 20 | .. | Slight; rare | ..... | II | B. refuses to take |
| 705 | 3,250 | 7 wks. | (a) Breast 7 wks. ..... (b) Br. + cert. milk M. 11 wks. | Underfed..... | 11 wks. | 168.1 | Exudative | 5,100 | 18 wks. | Fairly good | 100 | 37 | 168.5 | Infected arm; sup. adenitis; bronchitis; otitis | 90 | 10 | .. | Negative | ..... | I | Age |
| 708 | 3,460 | 13 wks. | (a) Br. 2-3 wks.; cert. milk mod. 10-11 wks. (b) Br. + cert. milk M. 2 wks. | Fairly good; umbilical hernia (twin) | 2 wks. | 170.0 | Negative | 3,800 | 15 wks. | Good | 75 25 Br. | 61 | 99.1 | Dyspepsia 2 times; ac. bronchitis; pyelocystitis | 80 | .. | 20 | Slight; rare | 34 60.5 49 66.0 | III | Age |
| 709 | 4,000 | 13 wks. | (a) Br. 2-3 wks.; then supp. feed.; then Br. + cert. milk M. (b) Br. + cert. milk M. 2 wks. | Good (twin)..... | 2 wks. | 105.0 | Negative | 4,210 | 15 wks. | Good | 75 25 Br. | 61 | 105.7 | Negative | 90 | 10 | .. | Slight; rare | 32 65.0 45 68.75 49 70.0 | I | Age |
| 710 | 2,800 | 9 wks. | (a) Supp. feeding 9 wks. ..... (b) S.M.A. on admission | Seborrhea of scalp; pedatrophy; large ant. fontanel | 0 | S.M.A. on adm. | S.M.A. on adm. | 2,800 | 9 wks. | Same as on admission | 100 | 47 | 145.7 | Negative | 65 | 35 | .. | Medium; rare | 30½ 66.5 39 69.0 42 71.0 | I | Age |
| 711 | 3,000 | 4 wks. | (a) Milk mod. 4 wks. ..... (b) S.M.A. on admission | Exudative; pedatrophy; eczema on buttocks; cesarean section | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,000 | 4 wks. | Same as on admission | 100 | 21 | 137.1 | Pneumonia; eczema on face | 80 | 20 | .. | Slight; rare | 18 58.1 17 60.5 | I | Irreg. delivery |
| 712 | 4,720 | 5 wks. | (a) Br. 1 wk.; cond. milk 2 wks.; wet nurse + cert. milk M. 2 wks. (b) S.M.A. on admission | Constipation; vomiting; underfed; seborrhea of scalp | 0 | S.M.A. on adm. | S.M.A. on adm. | 4,720 | 5 wks. | Same as on admission | 100 | 26 | 133.8 | Sl. eczema on face; sl. seborrhea of scalp | 90 | 10 | .. | Slight; rare | 12 61.0 23 65.25 | I | Irreg. delivery |
| 713 | 5,420 | 6 wks. | (a) Cert. milk M. 6 wks. ..... (b) Cert. milk M. 1 wk. | Constipation..... | 1 wk. | 180.0 (for 9 days) | Negative | 5,600 | 7 wks. | Same as on admission | 100 | 10 | 170.0 | Negative | 80 | 20 | .. | Negative | 12 60.0 | I | Moved |
| 714 | 2,980 | 10 wks. | (a) Br. + Horlick's 10 wks. ..... (b) Cert. milk M. 1 wk. | Well devel.; poorly nour.; Rt. inguinal hernia; dermatitis on buttocks | 1 wk. | 0 | Negative | 2,980 | 11 wks. | Same as on admission | 100 | 43 | 114.1 | Stomatitis; seborrhea of scalp | 90 | .. | 10* | Slight; rare | 22 58.75 | I | Age |
| 715 | 2,700 | 4 wks. | (a) Breast 4 wks. ..... (b) S.M.A. on admission | Fair; double hydrocele..... | 0 | S.M.A. on adm. | S.M.A. on adm. | 2,700 | 4 wks. | Same as on admission | 100 | 58 | 96.7 | Ac. bronchitis; ac. rhinitis; sl. dyspepsia | 95 | .. | 5 | Negative | ..... | II | Age |
| 716 | 4,000 | 7 wks. | (a) Br. 5 days; Nestle's Food 6 wks. (b) S.M.A. on admission | Fairly good; skin dry; emesis after feeding | 0 | S.M.A. on adm. | S.M.A. on adm. | 4,000 | 7 wks. | Same as on admission turgor decreased | 100 | 38 | 134.4 | Dyspepsia 1 time | 80 | 15 | 5 | Medium; freq. | 9 55.2 | II | Age |
| 718 | 3,650 | 8 wks. | (a) Breast 8 wks. ..... (b) Br. + cert. milk M. 3 wks. | Constipated; underfed..... | 3 wks. | 26.6 | Negative | 3,730 | 11 wks. | Negative | 100 | 39 | 166.4 | Sl. seborrhea of scalp | 97 | 3 | .. | Slight; rare | ..... | I | Age |
| 719 | 3,700 | 9 wks. | (a) Breast 9 wks. ..... (b) Br. + supp. feeding 6 wks. | Good; small..... | 6 wks. | —250.0 | Stomatitis; irregular attendance | 3,450 | 15 wks. | Underfed | 100 | 50 | 140.0 | Dyspepsia 1 time | 95 | .. | 5 | Negative | ..... | I | Age |
| 722 | 3,400 | 3 wks. | (a) Breast 3 wks. ..... (b) Br., then Br. + cert. milk M. 48 wks. | Thrush; sl. protrusion of umbilicus | 48 wks. | 88.7 | Otitis media; slight constipation | 7,660 | 51 wks. | Fairly good | 75 25 Br. | 15 | 114.0 | Sl. dyspepsia 2 times | 85 | .. | 15 | Negative | ..... | II | Age |
| 723 | 4,000 | 7 wks. | (a) Breast 7 wks. ..... (b) Breast 6 wks. | Good..... | 6 wks. | —40.0 | Negative | 3,760 | 13 wks. | Pale; thin | 100 | 42 | 50.4 | Dyspepsia; eczema; purulent otitis; anemia | 95 | .. | 5 | Slight; rare | ..... | I | Age |
| 725 | 2,430 | 2 wks. | (a) Breast 2 wks. ..... (b) S.M.A. on admission | Malnutrition..... | 0 | S.M.A. on adm. | S.M.A. on adm. | 2,430 | 3 wks. | Same as on admission | 50 50 Br. | 19 | 158.9 | Negative | 20 | 80 | .. | Medium; rare | ..... | I | Moved |
| 726 | 4,180 | 4 wks. | (a) Cond. milk 4 wks. ..... (b) S.M.A. on admission | Neg. except sl. eczema of face and scalp | 0 | S.M.A. on adm. | S.M.A. on adm. | 4,180 | 4 wks. | Same as on admission | 100 | 7 | 98.5 | Rhinitis | 100 | .. | .. | Slight; rare | ..... | I | Died (gastroenteritis) |
| 727 | 2,600 | 4 wks. | (a) Br. + tea and sugar 4 wks. .. (b) Breast 2 wks. | Underfed..... | 2 wks. | 40.0 | Negative | 2,680 | 5½ wks. | Negative | 75 25 Br. | 12 | 147.5 | Thrush | 100 | .. | .. | Slight; rare | ..... | I | Died (convulsions) |
| 728 | 3,780 | 4 wks. | (a) Breast 4 wks. ..... (b) Breast 1 wk. | Fair..... | 1 wk. | 0 | Negative | 3,780 | 6 wks. | Negative | 75 25 Br. | 57 | 126.3 | Rhinitis | 100 | .. | .. | Slight; rare | ..... | I | Age |
| 729 | 3,800 | 3 wks. | (a) ? ..... (b) S.M.A. on admission | Stomatitis..... | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,800 | 3 wks. | Same as on admission | 100 | 59 | 94.9 | Thrush; infected vaccination; dyspepsia; ac. pharyngitis; parenteral dyspepsia; ac. otitis media; nasopharyng. | 90 | 5 | 5 | Slight; rare | 4 54.25 19 62.5 25 64.0 30 66.0 37 67.0 | I | Age |
| 730 | 4,000 | 4 wks. | (a) Breast 4 wks. ..... (b) Breast 8 wks. | Good; umbilical hernia..... | 8 wks. | 105.0 | Exud. diathesis; loose green stools | 4,840 | 12 wks. | Good | 50 50 Br. | 20 | 164.0 | Bronchitis | 95 | 5 | .. | Slight; rare | ..... | I | Still on S.M.A |
| 733 | 3,210 | 4 wks. | (a) Breast 4 wks. ..... (b) Breast 8 wks. | Fair; regurgitates; sl. cold; rt. inguinal hernia | 8 wks. | 118.7 | Sl. vomiting and sl. dyspepsia | 4,160 | 12 wks. | Fair | 100 | 14 | 135.0 | Negative | 90 | 10 | .. | Slight; rare | ..... | I | Moved |
| 734 | 1,570 | 6 wks. | (a) Horlick's 6 wks. ..... (b) S.M.A. on admission | Premature; emaciated; constipated | 0 | S.M.A. on adm. | S.M.A. on adm. | 1,570 | 6 wks. | Same as on admission | 100 | 8 | 96.2 | Ulcer under tongue | 100 | .. | .. | Slight; rare | ..... | II | Died (pertussis) |
| 735 | 1,930 | 8 wks. | (a) Br. + Horlick's 8 wks. ..... (b) S.M.A. on admission | Relatively poor; sl. constipation; underfed (triplet) | 0 | S.M.A. on adm. | S.M.A. on adm. | 1,930 | 8 wks. | Same as on admission | 50 50 Br. | 11 | 162.7 | Stomatitis | 40 | 60 | .. | Slight; rare | ..... | I | Moved |
| 736 | 2,430 | 8 wks. | (a) Breast 8 wks. ..... (b) S.M.A. on admission | Fair (triplet); phimosis; double hydrocele | 0 | S.M.A. on adm. | S.M.A. on adm. | 2,430 | 8 wks. | Same as on admission | 50 50 Br. | 9 | 172.2 | Negative | ... | 100 | .. | Slight; rare | ..... | I | Moved |
| 737 | 2,780 | 8 wks. | (a) Br. + Horlick's 8 wks. ..... (b) S.M.A. on admission | Good; negative (triplet)..... | 0 | S.M.A. on adm. | S.M.A. on adm. | 2,780 | 8 wks. | Same as on admission | 50 50 Br. | 9 | 230.0 | Negative | 40 | 60 | .. | Slight; rare | ..... | I | Moved |
| 738 | 3,910 | 4 wks. | (a) Mellin's 2 wks.; cond. milk 2 wks. (b) S.M.A. on admission | Fairly good..... | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,910 | 4 wks. | Same as on admission | 100 | 46 | 134.3 | Thrust, rhinitis. At end of feeding sl. bowed legs and enlarged epiphyses | 98 | . | 2 | Negative | ..... | I | Age |
| 739 | 2,460 | 2 wks. | (a) Malted milk 2 wks. ..... (b) S.M.A. on admission | Poor; turgor very poor; cleft palate | 0 | S.M.A. on adm. | S.M.A. on adm. | 2,460 | 2 wks. | Same as on admission | 100 | 39 | 154.8 | Rhinitis; exud. diathesis; otitis media; cough | 95 | 2 | 3 | Negative | ..... | I | Moved |
| 740 | 4,140 | 20 wks. | (a) Br. 19 wks.; Br. + milk mod. 1 wk. (b) S.M.A. on admission | Poor; underfed..... | 0 | S.M.A. on adm. | S.M.A. on adm. | 4,140 | 20 wks. | Same as on admission | 75 25 Br. | 36 | 68.3 | Eczema; boils; dermatitis | 85 | 10 | 5 | Negative | ..... | II | Age |
| 741 | 3,800 | 9 wks. | (a) Br. + store milk 9 wks. ..... (b) S.M.A. on admission | Fair; dyspepsia..... | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,800 | 9 wks. | Same as on admission | 100 | 47 | 96.8 | Exudative; dyspepsia; pallor; cold; measles; double otitis media | 85 | 10 | 5 | Negative | ..... | II | Still on S.M.A. |
| 744 | 3,250 | 17 wks. | (a) Br. 2 wks.; Horlick's 15 wks. (b) S.M.A. on admission | Poor; constipated..... | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,250 | 17 wks. | Same as on admission | 100 | 21 | 64.2 | Pertussis | 90 | .. | 10 | Slight; rare | ..... | II | P. P. advised against |
| 745 | 3,140 | 5 wks. | (a) Br. + supp. feeding 5 wks. ... (b) S.M.A. on admission | Good; umbilical hernia (twin) | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,140 | 5 wks. | Same as on admission | 75 25 Br. | 44 | 118.1 | Pertussis; otitis media | 85 | 15 | .. | Slight; rare | ..... | I | Still on S.M.A. |
| 746 | 2,830 | 5 wks. | (a) Br. + supp. feeding 5 wks. ... (b) S.M.A. on admission | Good (twin)..... | 0 | S.M.A. on adm. | S.M.A. on adm. | 2,830 | 5 wks. | Same as on admission | 75 25 Br. | 44 | 108.6 | Pertussis; otitis media | 85 | 15 | .. | Slight; rare | ..... | I | Still on S.M.A. |
| 748 | 3,050 | 4 wks. | (a) Br. 2½ wks.; water only last 10 days (b) Br. + cert. milk M. 3 wks. | Very poor..... | 3 wks. | 56.6 | Negative | 3,220 | 7 wks. | Same as on admission | 75 25 Br. | 42 | 161.6 | Rhinitis; pertussis; cough | 95 | 2 | 3 | Negative | ..... | I | Moved |
| 749 | 3,600 | 19 wks. | (a) Br. 13 wks.; Br. + Borden's 6 wks. (b) S.M.A. on admission | Fairly good; premature (7 mos.) (twin) | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,600 | 19 wks. | Same as on admission | 75 25 Br. | 11 | 22.7 | Dyspepsia | 70 | 10 | 20 | Slight; rare | ..... | IV | Dyspepsia |
| 750 | 3,580 | 19 wks. | (a) Br. 13 wks.; Br. + Borden's 6 wks. (b) S.M.A. on admission | Fairly good; premature (7 mos.) (twin) | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,580 | 19 wks. | Same as on admission | 75 25 Br. | 11 | 9.9 | Dyspepsia | 70 | 10 | 20 | Slight; rare | ..... | IV | Dyspepsia |
| 751 | 3,210 | 6 wks. | (a) Milk mod. 6 wks. ..... (b) S.M.A. on admission | Thin; underfed; rhinitis..... | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,210 | 6 wks. | Same as on admission | 100 | 43 | 105.3 | Rhinitis | 98 | .. | 2 | Slight; rare | ..... | I | Still on S.M.A. |
| 752 | 4,320 | 14 wks. | (a) Breast 14 wks. ..... (b) S.M.A. on admission | Thin; underfed; constipated | 0 | S.M.A. on adm. | S.M.A. on adm. | 4,320 | 14 wks. | Same as on admission | 75 25 Br. | 42 | 130.0 | Cold; seborrhea on scalp | 95 | 5 | .. | Negative | ..... | I | Died (pneumonia) |
| 753 | 3,650 | 12 wks. | (a) Breast 12 wks. ..... (b) S.M.A. on admission | Poor; underfed; constipated; exud. diathesis | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,650 | 12 wks. | Same as on admission | 75 25 Br. | 20 | 122.0 | Pylorospasm; exudate behind ears; sl. rhinitis | 95 | .. | 5 | Slight; rare | ..... | I | M. indifferent |
| 755 | 2,470 | 3 wks. | (a) Breast 3 wks. ..... (b) S.M.A. on admission | Fairly good cond. (twin).... | 0 | S.M.A. on adm. | S.M.A. on adm. | 2,470 | 3 wks. | Same as on admission | 75 25 Br. | 27 | 135.5 | Cough | 95 | 5 | .. | Negative | ..... | I | Still on S.M.A |
| 756 | 2,390 | 3 wks. | (a) Breast 3 wks. ..... (b) S.M.A. on admission | Fairly good (twin); stools green | 0 | S.M.A. on adm. | S.M.A. on adm. | 2,390 | 3 wks. | Same as on admission | 75 25 Br. | 27 | 155.1 | Cough | 95 | 5 | .. | Slight; rare | ..... | I | Still on S.M.A. |
| 757 | 3,010 | 7 wks. | (a) Br. 6½ wks.; Br. + store milk ½ wk. (b) S.M.A. on admission | Underfed..... | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,010 | 7 wks. | Same as on admission | 100 | 30 | 106.6 | Buttocks chafed; cold | 95 | 5 | .. | Negative | ..... | I | Still on S.M.A |
| 758 | 3,320 | 4 wks. | (a) Breast 4 wks. ..... (b) Breast 1 wk. | Good; constipated..... | 1 wk. | —170.0 | Negative | 3,150 | 5 wks. | Same as on admission | 75 25 Br. | 25 | 100.4 | Rhinitis; cerv. adenitis; cold lasting 4 mos. | 95 | 5 | .. | Negative | ..... | I | Still on S.M.A |
| 759 | 4,040 | 11 wks. | (a) Breast 11 wks. ..... (b) Breast 3 wks. | Constipated; angioma; cond. fairly good | 3 wks. | 126.6 | Negative | 4,420 | 14 wks. | Fair | 50 50 Br. | 23 | 126.9 | Rhinitis | 50 | 50 | .. | Medium; rare | ..... | I | Still on S.M.A. |
| 760 | 3,180 | 5 wks. | (a) Breast 5 wks. ..... (b) Breast 9 wks. | Good; phimosis; umbilical hernia slight; desquamation slight | 9 wks. | 108.8 | Negative | 4,160 | 14 wks. | Fairly good | 75 25 Br. | 19 | 168.9 | Rhinitis | 80 | 20 | .. | Slight; rare | ..... | I | Still on S.M.A. |
| 761 | 2,800 | 3½ wks. | (a) Br. 3 wks.; Br. + patent food ½ wk. (b) S.M.A. on admission | Thin; underfed..... | 0 | S.M.A. on adm. | S.M.A. on adm. | 2,800 | 3½ wks. | Same as on admission | 75 25 Br. | 21 | 238.0 | Rhinitis; eczema back of ears | 100 | .. | .. | Slight; rare | ..... | I | Indifferent |
| 762 | 2,600 | 5 wks. | (a) Breast 5 wks. ..... (b) S.M.A. on admission | Fair; underfed; dry, red skin | 0 | S.M.A. on adm. | S.M.A. on adm. | 2,600 | 5 wks. | Same as on admission | 75 25 Br. | 22 | 166.8 | Negative | 100 | .. | .. | Slight; rare | ..... | I | Still on S.M.A. |
| 763 | 3,190 | 4 wks. | (a) Breast 4 wks. ..... (b) Breast 6 wks. | Fair; undersize; turgor poor | 6 wks. | 71.6 | Constipated | 3,620 | 10 wks. | Sl. improvement | 75 25 Br. | 16 | 217.5 | Cough | 98 | .. | 2 | Medium; freq. | ..... | I | Still on S.M.A. |
| 764 | 5,300 | 15 wks. | (a) Br. 4 wks.; 1 Br. + store milk 11 wk. (b) S.M.A. on admission | Green, loose stools..... | 0 | S.M.A. on adm. | S.M.A. on adm. | 5,300 | 15 wks. | Same as on admission | 100 | 20 | 125.0 | intertrigo; rhinitis | 100 | .. | .. | Negative | ..... | I | Still on S.M.A |
| 765 | 3,820 | 14 wks. | (a) Br. 4 wks.; Br. + cow's milk 10 wks. (b) S.M.A. on admission | Fair; underfed..... | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,820 | 14 wks. | Same as on admission | 100 | 18 | 175.5 | Negative | 100 | .. | .. | Negative | ..... | I | Still on S.M.A. |
| 766 | 3,830 | 5 wks. | (a) Breast 5 wks. ..... (b) S.M.A. on admission | Fairly good; scaling of skin; pap. eruption of face and chest | 0 0 | S.M.A. on adm. | S.M.A. on adm. | 3,830 | 5 wks. | Same as on admission | 50 50 Br. | 19 | 207.8 | Exud. diathesis | 100 | .. | .. | Negative | ..... | I | Still on S.M.A. |
| 767 | 3,030 | 8 wks. | (a) Br. 1 wk.; milk mod. 7 wks. .. (b) S.M.A. on admission | Fair; slight seborrhea of scalp | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,030 | 8 wks. | Same as on admission | 100 | 12 | 165.8 | Rhinitis; seborrhea of scalp | 80 | 20 | .. | Negative | ..... | I | Still on S.M.A. |
| 768 | 3,130 | 5 wks. | (a) Br.1 wk.; milk mod. 1 wk.; cond. dry milk 3 wks. (b) S.M.A. on admission | Chafed buttocks; sl. umbil. hernia; separation of recti muscles | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,130 | 5 wks. | Same as on admission | 100 | 16 | 221.8 | Coryza; sl. exudative | 100 | .. | .. | Negative | ..... | I | Still on S.M.A. |
| 769 | 3,260 | 7 wks. | (a) Breast 7 wks. ..... (b) S.M.A. on admission | Thin; underfed..... | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,600 | 7 wks. | Same as on admission | 100 | 12 | 222.5 | Coryza | 50 | 50 | .. | Negative | ..... | I | Still on S.M.A. |
| 771 | 3,510 | 4 wks. | (a) Breast 4 wks. ..... (b) S.M.A. on admission | Fair..... | 0 | S.M.A. on adm. | S.M.A. on adm. | 3,510 | 4 wks. | Same as on admission | 75 25 Br. | 13 | 158.4 | Negative | 88 | 10 | 2 | Negative | ..... | I | Still on S.M.A. |

(OVER)



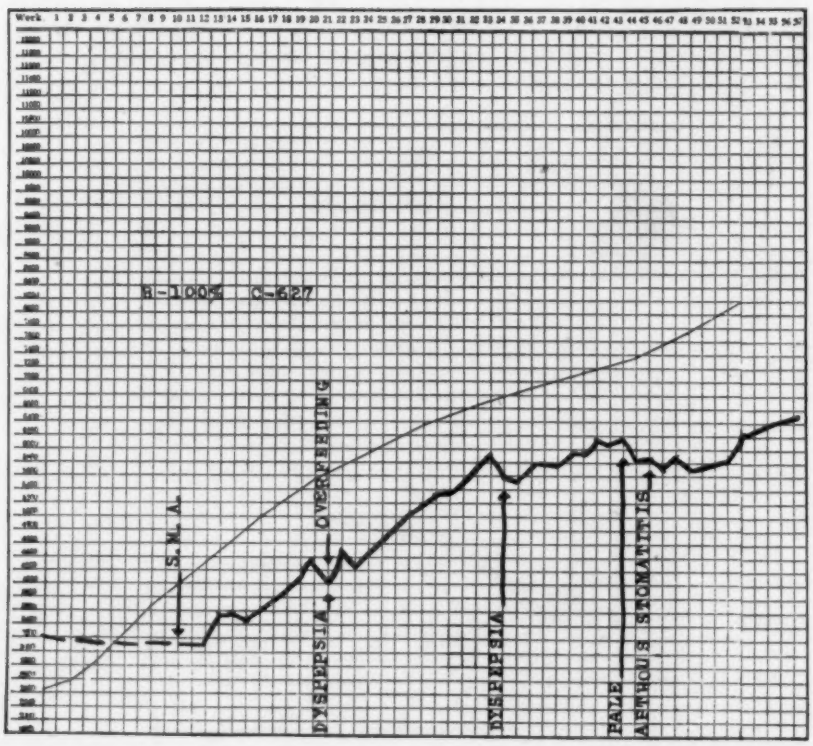



Chart 17.—Birth weight supposed to have been 3,200 gm. Admitted to the dispensary, Dec. 22, 1915, at the age of 2½ months, weighing 3,160 gm. It was given only 5x110 S. M. A. and did not increase in weight for two weeks, when the food was raised in amount to 5x120. The patient during the fourteenth week became a suspicious case of pertussis and was sent to the hospital, from which, however, it was returned within a week. Through some error it was given 5x200 S. M. A. Its weight increased decidedly, but with the twentieth week it developed a dyspepsia. The nurse reported that the home conditions were extremely poor, and the history notes that the child is paler and its turgor less firm. After the recovery from the dyspepsia the weight curve rose incessantly until the thirty-third week, when another dyspepsia was ushered in during the middle of June. As a result the child lost decidedly in weight and began to climb again in a very irregular and acute manner, breaking on the downward course to the forty-fifth week with symptoms of an aphthous and ulcerative stomatitis. The mother claims the child gets half an orange daily. She works daily and puts the child in a nursery. This is questionable. The child managed to get through the summer and began to thrive with the beginning of fall, with a change in diet consisting of cow's milk, vegetables and farina. Whether the poor result in the latter half of this child's history was due to an insufficient quantity of orange juice and to summer conditions, is a question. It is possible that both played a part. The decided pallor and the reduction in the turgor, mentioned at different places in the history, speak in favor of the inadequate amount of orange juice in the diet. A fair result.

milk than in human milk, and as it is important that this ion be present in sufficient quantity. Schloss[9] himself added it to a mixture containing 330 c.c. of skimmed milk. On the other hand, however, in his own work,[10] while describing a simple household method for making his milk, he resorts to the mixture of ⅙ milk, ⅙ of 15 per cent. cream and ⅙ water, 15 gm. flour, and 35 gm. sugar, but omits the addition of the potassium chlorid.

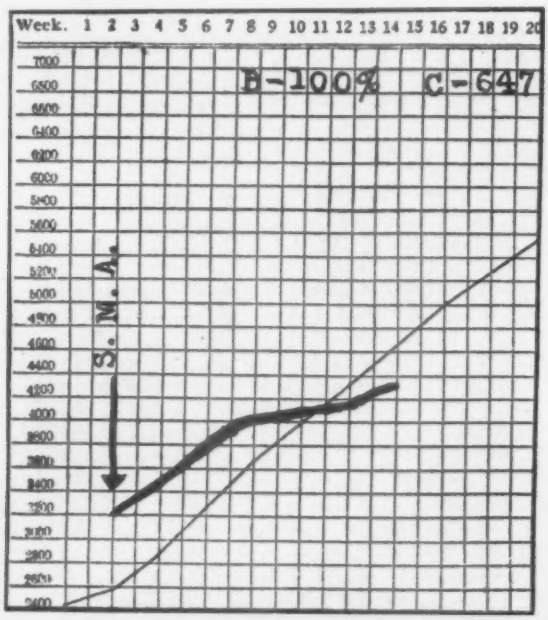



Chart 18.—Illegitimate baby, artificially fed from birth. Entered dispensary, March 5, 1918, at the age of 12 days, and weighing 3,230 gm. As the breast contained a little milk, the mother was urged to nurse the baby and give 7x50 S.M.A. besides. After a week the weight had increased 120 gm. The infant refused to take the breast and 6x80 S.M.A. was ordered. Within five days the weight had increased 145 gm. and the orange juice increased 1 dram four times a day. After two weeks the weight had again been increased by 305 gm., and within another two weeks 220 gm. Then, however, its weight remained practically stationary for three weeks, only rising at a better angle during the last two weeks. After the first few weeks the child was placed with a boarding mother, who did not, we believe, carry out the orders of the physician. It is probable that the infant had received practically no orange juice during this time and that the poor gain in weight is due to this. The reason why it is believed this caused the break in the weight chart at this specific boarding home is because other infants of the same age and weight in more reliable hands thrive differently with exactly the same food. Of course, individual babies vary, but other babies with the same boarding-house mother do not thrive. A fair result.

### FAT CONSTITUENT

In the preparation of the fat three requisites were considered: (1) saponification, iodin, Reichert-Meissl and melting point values to be like those of breast milk fat; (2) the presence of an adequate amount of the fat soluble growth factor, and (3) the use of cod

9. Langstein-Meyer, 1914, p. 270.
10. Schloss: Ueber Säuglingsernährung, 1912, p. 83.

liver oil as a prophylactic against rickets. It is known that cod liver oil possesses the fat soluble growth factor in a greater degree than any fat except butter, so it seems wise to try to use this fat, especially in appreciation of its great value in the treatment and prophylaxis of rickets. One very definite reason for desiring to incorporate cod liver oil in the fat mixture was based on Schloss's experience with his own milk. He found that quite a few of his children showed mild

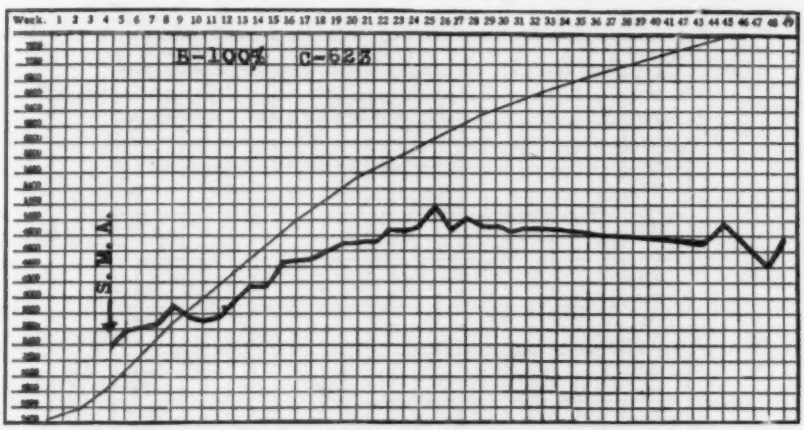



Chart 19.—Never breast-fed. Received one-half milk and one-half water every three hours since birth. Entered dispensary, Nov. 2, 1915, at the age of 1 month, weighing 3,340 gm. Was given 6x90 S. M. A. and responded quite well with a gain of 480 gm. in twenty-five days. The baby then did not gain for a few months, but was evidently underfed, as it responded quickly with a good rise when the food was increased. After another three weeks, however, the weight again became nearly stationary, rising at a very acute angle, even though the food was increased. The child vomited occasionally, but the stools were good. At this time, namely, at the seventeenth week, the child developed an otitis media, and after improvement of this condition the child again gained. The otitis media recurred again with the twenty-sixth week, and this was followed by a sharp drop in weight, and then by a more gradual decline throughout the next eighteen weeks. At the fifth week it measured 51.75 cm. in length, and had increased to 61.25 by the twenty-fifth week and 62.5 cm. the thirty-first week, and remained at this length during the next ten weeks. In other words, the child had not only ceased to gain in weight, but also to gain in length. During the thirty-second week a hematuria was noticed, and the giving of orange juice was strenuously urged. At the forty-fourth week the child had loose stools and a poor appetite, but the urine was normal. One week later the sister, who was caring for the child, admitted the child had for a long time refused to take orange juice, and she was urged to use a medicine dropper. After two weeks the child came to the dispensary in a severe state of intoxication. The history notes that it had been ill and that the food had been continued. The child died within another twenty-four hours. The home conditions in this case were extremely poor, and we believe that the poor result is partly explained by the history finally obtained from the sister, namely, that the child received no orange juice. From the history, no symptoms of scurvy other than the hematuria can be obtained. A poor result.

signs of rickets. He believes, however, that another factor than the food, or at least besides the food, is concerned in the production of this condition, inasmuch as he saw it develop in the same institution among infants fed with breast milk. On the other hand, Bahrdt,[11] in his report on Friedenthal's milk, which contained only butter fat, saw

11. Bahrdt, H., Bamberg, Edelstein and Hornemann: Ernährungsversuche mit Friedenthalscher Milch, Ztschr. f. Kindern., Orig., **10**:303, 1914.

no cases of rickets develop. He says, however, that his observation has not been extensive and prolonged enough to permit him to make a final decision and so he wishes to reserve his opinion until a time when more children can be watched for a longer time.

In this connection it might be stated that the cod liver oil, which represents 10 per cent. of the fat, can hardly be tasted in the mixture used by us, so that we have found it possible to give an adequate amount of this fat in a very palatable manner.

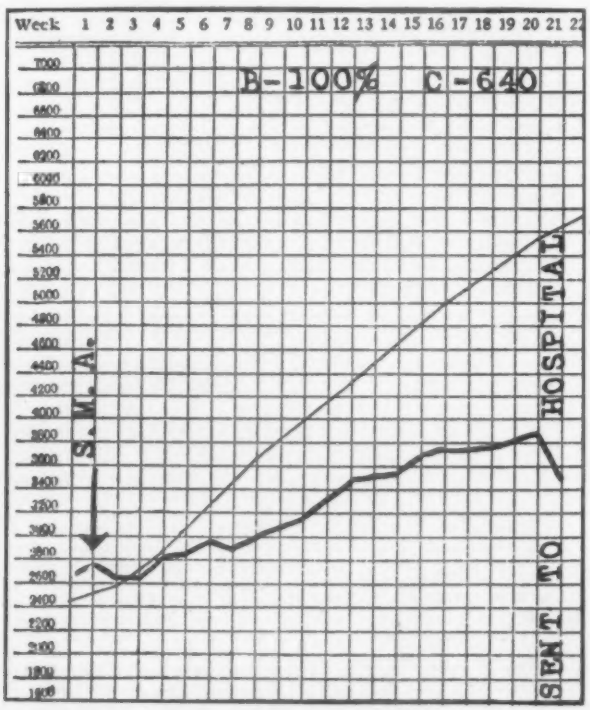



Chart 20.—Illegitimate baby, bottle-fed from birth. Mother 17 years of age. The first part of the stationary weight chart was due to an insufficient number of calories in the food. The second inadequate gain occurred even though the infant received a sufficient number of calories. The child was taken from S. M. A. at the age of 21 weeks on account of a bronchitis and otitis media, for which it was sent to the hospital. It was put on Keller's soup and did not thrive much better on this. A Wassermann test was done which was negative. Later on it vomited after each feeding and then had a hematuria, and was again sent to the hospital, where it remained for two months, and where it gained 1,200 gm. On returning to the dispensary the child was put on a simple dilution, on which it also did not thrive. In short, this child did not thrive well on any diet. A poor result.

In order constantly to get the same saponification, iodin, Reichert-Meissl and melting point values of the S. M. A. fat, it is necessary to purchase the different fats in large amounts so that ample opportunity may be given for the analysis of the individual samples and the final mixture. This was possible in the beginning of our work, as we then had at our disposal the large cooling facilities of the Telling-Belle

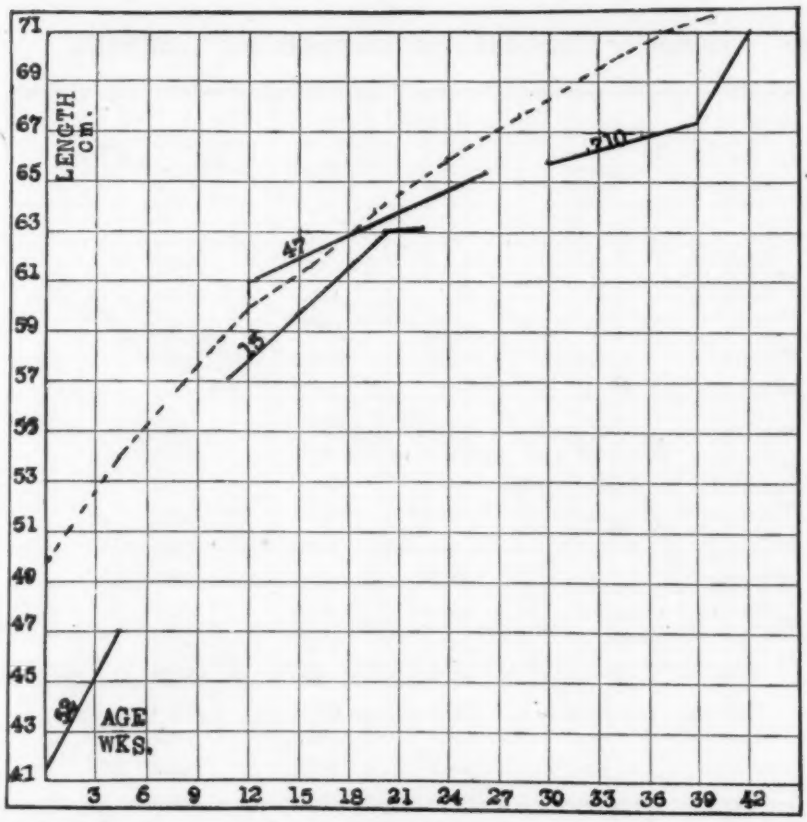



Chart 21.—Length curves for boys at Dispensaries IV, V, and VI. Dotted line = normal.

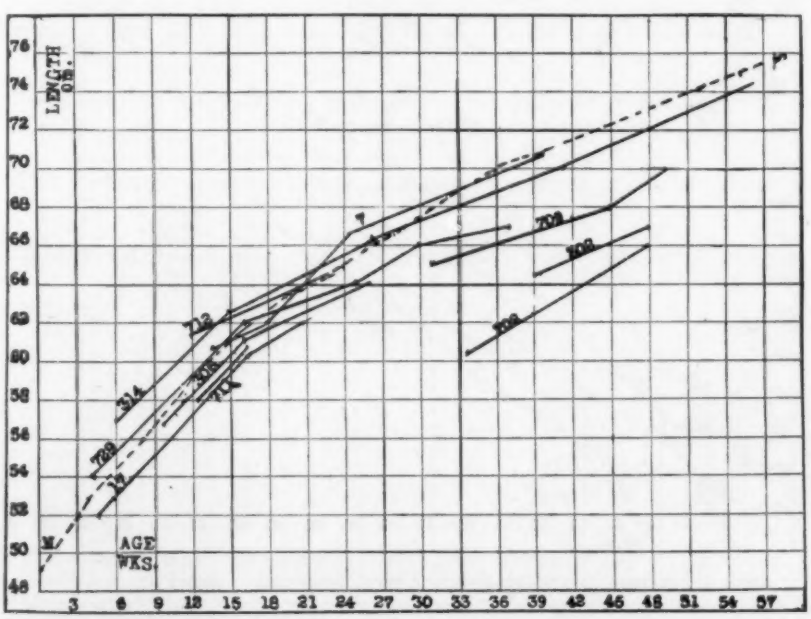



Chart 22.—Length curves for girls at Dispensaries IV, V, and VI. Dotted line = normal.

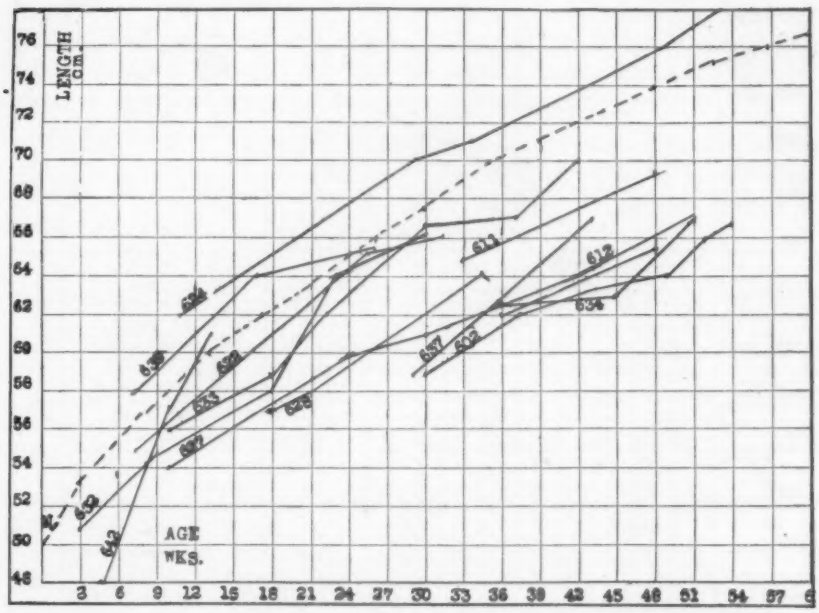



Chart 23.—Length curves for boys at Central Dispensary. Dotted line = normal.

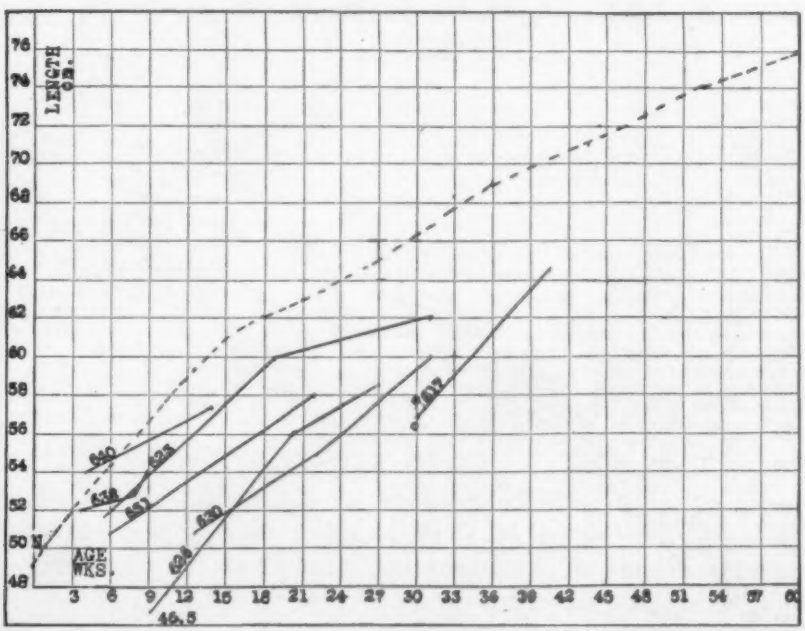



Chart 24.—Length curves for girls at Central Dispensary. Dotted line = normal.

TABLE 1.—SHOWING THE AMOUNTS OF VARIOUS CONSTITUENTS USED IN MAKING THE DIFFERENT UNITS OF S. M. A.

| Unit | Skimmed Milk, C.c. | Distilled Water, C.c. | Milk Sugar, Gm. | Potassium Chlorid, Gm. | S. M. A. VIII Fat, Gm. |
|---|---|---|---|---|---|
| 1 | 3,980 | 5,860 | 620 | 2.0 | 385.0 |
| 1½ | 5,970 | 8,700 | 930 | 3.0 | 577.5 |
| 2 | 7,960 | 11,720 | 1,240 | 4.0 | 770.0 |
| 2½ | 9,950 | 14,650 | 1,550 | 5.0 | 962.5 |
| 3 | 11,940 | 17,580 | 1,860 | 6.0 | 1,155.0 |
| 3½ | 13,930 | 20,510 | 2,170 | 7.0 | 1,347.5 |
| 4 | 15,920 | 23,440 | 2,480 | 8.0 | 1,540.0 |
| 4½ | 17,910 | 26,370 | 2,790 | 9.0 | 1,732.5 |
| 5 | 19,900 | 29,300 | 3,100 | 10.0 | 1,925.0 |
| 5½ | 21,890 | 32,230 | 3,410 | 11.0 | 2,117.5 |
| 6 | 23,880 | 35,160 | 3,720 | 12.0 | 2,310.0 |
| 6½ | 25,870 | 38,090 | 4,030 | 13.0 | 2,502.5 |
| 7 | 27,860 | 41,020 | 4,340 | 14.0 | 2,695.0 |
| 7½ | 29,850 | 43,950 | 4,650 | 15.0 | 2,887.5 |
| 8 | 31,840 | 46,880 | 4,960 | 16.0 | 3,080.0 |
| 8½ | 33,830 | 49,810 | 5,270 | 17.0 | 3,272.5 |
| 9 | 35,820 | 52,740 | 5,580 | 18.0 | 3,465.0 |
| 9½ | 37,810 | 55,670 | 5,890 | 19.0 | 3,657.5 |
| 10 | 39,800 | 58,600 | 6,200 | 20.0 | 3,850.0 |

N. B.: Every time a batch of S. M. A. milk is made, no matter how large or how small, 200 c.c. of water are to be subtracted from the total amount of water used in the batch because the homogenizer itself retains after cleaning 200 c.c. of water.

TABLE 2.—REASONS FOR REMOVAL FROM S. M. A.—INFANTS FED WITH S. M. A. FOR LESS THAN SIX WEEKS

(Total for Disp. IV, V, VI, and Central)

| Length of Time on S. M. A. | No. Cases | Moved | Baby Does Not Care for S. M. A. | Private Physician Advised Against | Vomiting | Dyspepsia | Unfair Cases | Mother Indifferent | Did Not Return | Still on S. M. A. | Sufficient Breast Milk | No Reason Given |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 days | 5 | .. | .. | 1 | 1 | 2 | .. | 1 | .. | .. | .. | .. |
| 1 week | 23 | 1 | 5 | 2 | 1 | 1 | 2 | 7 | 1 | .. | 1 | 2 |
| 2 weeks | 14 | .. | 3 | 2 | 1 | 1 | 2 | 2 | 1 | .. | 2 | .. |
| 3 weeks | 16 | 3 | 1 | .. | .. | 2 | 1 | 6 | 1 | 1 | 1 | .. |
| 4 weeks | 10 | 2 | .. | 2 | .. | .. | .. | 3 | 2 | .. | .. | 1 |
| 5 weeks | 6 | 1 | 1 | .. | .. | 1 | .. | 3 | .. | .. | .. | .. |
| Total... | 74 | 7 | 10 | 7 | 3 | 7 | 5 | 22 | 5 | 1 | 4 | 3 |
| Per cent | | 9.4 | 13.5 | 9.4 | 4 | 9.4 | 6.7 | 29.2 | 6.7 | 1.3 | 5.4 | 4 |

Vernon Company, to whom we are greatly indebted, but since—for two years—we have been preparing and keeping the fats in the Babies' Dispensary and Hospital laboratory with rather limited cooling facilities, we have been prevented from purchasing amounts large enough to enable us to check our mixtures in a manner that would give us the exact saponification, iodin, Reichert-Meissl and melting point values. The only character number, however, which varied distinctly was the iodin number—from 45 to 55, usually between 46 to 50. Whether this difference represents a distinct disadvantage or not is a question. Nevertheless, it should be the aim—and there is no reason why this cannot be accomplished if the mixture is to be made on a rather large scale—to get the analytic figures as they should be. The fats that have been used to make the S. M. A. fat on which this report is based are the following:

| | |
|---|---|
| Tallow oil | 0 to 10 per cent. |
| Cocoanut oil | About 15 per cent. |
| Cocoa butter | About 20 per cent. |
| Cod liver oil | 10 per cent. |
| Tallow | 55 to 45 per cent. |

Table 1 gives the absolute amounts of the various constituents used in making the different units of S. M. A. A unit consists of enough material to make 10 + liters of milk.

## METHOD OF MIXING

In the first report a method of mixing was described. Since then this has been simplified by using a small modern pasteurizer as a warming and mixing machine for the skimmed milk, sugar, salt and water mixture and by allowing the fat in a heated, liquid state to join this mixture outside of the pasteurizing vat in a common tube, through which both flow into the homogenizer. By doing this no fat can flow back into the skimmed milk, water, salt, and sugar mixture and, therefore, all stirring and agitation are made unnecessary, as all of the milk is put into one common bottling vat before filling any of the bottles, and so adequate mixing and uniform distribution of the various constituents is assured.

Analyses of samples of S. M. A. made at different periods are as follows:[12]

| | |
|---|---|
| (1) Fat | 3.52 |
| Sugar | 7.59 |
| Protein | 1.33 |
| Ash | 0.29 |

12. We wish to take this opportunity to express our great indebtedness to the chemical department of Adelbert College for cooperation and advice; especially are we appreciative of the help given by Professors Gruener and Germann.

(2) Fat .....3.7
Sugar .....7.0
Protein .....1.4
Ash .....0.266
Freezing point .....0.606

(3) Fat .....3.79
Sugar .....7.8
Protein .....1.39
Ash .....0.275
Freezing point .....0.632
Electrical conductivity at 18 C.....$22 \times 10^{-4}$

It was realized from the beginning that to obtain a correct idea of the real practical value of such milk as S. M. A. three conditions must be fulfilled: (1) that a large number of well infants must be fed with the milk; (2) that the feeding must be continued over a long period, that is, from twenty to fifty weeks, and (3) that as many very young infants as possible be fed with this food and their development observed.

The only opportunity available locally for such an observation was to be found at the Prophylactic Babies' Dispensaries and at the Central Dispensary for sick infants. Three Prophylactic Dispensaries were chosen for the bulk of the work and only the Central Dispensary utilized for disturbed infants or small, well infants living in the neighborhood of this institution. The physicians at the Prophylactic Dispensaries were instructed and supervised in the feeding of S. M. A. for nearly a year. Then they were requested to choose and feed the babies without supervision, in order that the possible subjective views of the author might be eliminated. This would mean an impartial practical test of the food and would also indicate how well it is adapted for general use by the family physician.

## CLASSIFICATION OF CASES

It is impossible to divide such a material based, except in a few instances, on dispensary cases and observed and interpreted by different men, into cases that are considered absolutely normal, slightly abnormal and slightly ill. Some of the children were distinctly handicapped; for instance, premature infants, or infants who had been underfed and poorly fed for a month or more after birth, but these cases were decidedly in the minority, and we feel that the biggest percentage of the babies in the group discussed can be called, in the broad sense, normal babies. Quite a number of infants ill in hospital wards were fed S. M. A. for a long time, but inasmuch as they were being studied from a metabolic standpoint, and as the feeding conditions were varied from time to time, they could not be included in this report.

It is hoped at a later time to make a specific report on these children and others remaining in institutions for a long time. It should be stated, however, that the feeding results with S. M. A. in these hospital infants have been excellent (refer to weight charts 7 and 13). The difference in appearance, in behavior, in disposition, in color, in firmness of subcutaneous tissue, in weight, and in stools, etc., between these children and others fed on simple dilution mixtures, Keller's soup and casein milk, has been remarkable. The one of us who has been observing these children especially has never seen infants fed otherwise in the same institution look nearly as well.

### AN ANTISCORBUTIC NECESSARY IN THE DIET

In order to get good results in feeding S. M. A. over a long period it is essential that an antiscorbutic be given as long as it is prepared over the route of pasturization. This experience was definitely obtained in some of the hospital infants. In the patients going to the dispensaries, orange juice was given from the beginning as a prophylactic measure, to guard against the development of a disturbed nutrition that might plausibly arise when an infant is being fed a food that in its manufacture is heated to the pasteurizing point and which has a high sugar content. The plan followed was to wait one week after the beginning of feeding with S. M. A. to ascertain the condition of the stools. If these were not thin, then orange juice was given, even to the smallest and youngest infants, in from ½ to 1 teaspoonful doses, twice daily. In a month this was increased to 4 teaspoonfuls, twice daily, and later, in many instances, a total dose of 16 teaspoonfuls for the twenty-four hours was given.

As to the amounts that the different infants were fed, we can only say that these were gaged by the condition and the age of the infant. Roughly speaking, the infants received approximately the same amount of S. M. A. as breast fed babies of their age and weight would get milk from their mother's breasts. In special cases the caloric check was employed. The caloric value for 1 liter of S. M. A. on an average is 680 calories; the maximum being about 700, and the minimum about 660.

### RESULTS

The results obtained in feeding the total 311 infants for from six to sixty weeks are presented in the accompanying tables, and in the individual tabular records appended to the article.

The accompanying weight charts with their legends illustrate the various types of results: excellent, good, fair and poor. That we should have some fair and bad results was, of course, to be expected. We observe them in infants fed at the breast and it is often impossible

to decide whether it is primarily and mainly the food or the deficient or abnormal hereditary factor in the child which is at fault. In the case of breast milk, it is, in all probability, due to the child, but even here the old idea of the injuriousness or defectiveness of breast milk must be admitted to be at least a theoretic possibility in some cases, especially in consideration of the reports regarding the development of beriberi in infants getting no other food than the breast milk of the mothers ill with the same disease. An illustration of such an unfathomable case is the following:

CASE 15 (E. H.).—*Family History.*—Father and mother living and well; four brothers and sisters, living and well. One sister died, August, 1913, at the age of 6 weeks, with "summer complaint."

*Personal History.*—The patient was breast-fed for three weeks, then received supplementary feeding for two weeks; had a dyspepsia while taking only breast milk. This was somewhat improved on a mixed feeding. At 6 weeks of age the child showed signs of an exudative diathesis, but seemed agile and happy, was quite well nourished and firm. Its weight was 4,040 gm.

*Treatment.*—It was given S. M. A. and orange juice, on which it gained, weighing at the age of thirty weeks, 6,600 gm., representing a total gain of 2,560 gm., or an average gain per week of 106 gm. At 7½ months it had four teeth and the fontanel was nearly closed, the infant seemed well in every way and showed no signs of spasmophilia. At that time its weight remained stationary for two weeks and its diet was then changed to 4 x 250 S. M. A. and 1 cup of farina soup. It only gained 20 gm. during the following week, but had not taken its farina. In another two weeks it weighed a total of 7,000 gm., and had gained a total of 320 gm., or an average of 160 gm. per week. The mother said, however, that she had to force the child to take both the bottle and the farina. Two weeks later, August, 1916, the weight was the same and the child showed a slight bronchitis and a dyspepsia. In another week it had lost 130 gm., weighing 6,870 gm. During the previous week it had developed a fever of 103 F. and had convulsions There were no signs of spasmophilia. The stools were normal. In another week the weight had returned to its former level and in the meantime the left ear had begun discharging.

During the following month, even though the food, orange and farina were well taken, the infant did not gain in weight and consequently from 1 to 2 teaspoonfuls of vegetable were added to the farina. Three days later the weight was 6,780 gm. The child vomited severely and had from six to eight loose stools. The mother stopped the food, gave castor oil and barley water and then one-half skimmed milk and one-half barley water. In two days the bowels had improved and the child had gained in weight to 6,950 gm. The child improved and was placed on a diet of 600 skimmed milk and 400 barley water, with 2 teaspoonfuls of sugar, and in a week this was increased to 650 milk and 350 cornstarch water. After 2 weeks the weight was 6,730 gm. or 220 gm. less than before and there was edema of the lids. The stools were normal and there was no vomiting. The child coughed slightly. The food was changed to one-half milk and one-half oatmeal water, with 3 teaspoonfuls of cane sugar, a total of 1,000 gm. The weight dropped to 6,500 gm. in three days, but the child seemed better and happier. The diet was increased to 600 milk and 500 cornstarch water, with 4 teaspoonfuls of sugar, and the weight increased 190 gm. in four days, to a total of 6,690 gm., and to 7,150 gm. in another week, making an additional gain for that week of 460 gm., and to 7,510 gm. in still another week, and in an additional 2 weeks to 8,200 gm., making a total gain for the month of 1,150 gm. During the following two weeks there was no gain and an eczema appeared. The length at this time—11½ months of age—was 72.5 cm., or 1½ cm. less than normal. At 2 months of age the length was 57.5 cm.

TABLE 3.—Reasons for Removal from—
(Total for Disp. IV,—

| Length of Time On S. M. A. (Weeks) | No. Cases | Moved | Refuses to Take | Private Physician Advised Against | Vomiting | Dyspepsia | Intercurrent Disease | Mother Indifferent | Did Not Return | Still On S. M. A. | Not Gaining |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 6-10 | 47 | 13 | 3 | 5 | .. | 1 | .. | 12 | 3 | 1 | .. |
| 11-15 | 52 | 8 | 3 | 3 | 1 | 4 | 1 | 7 | 1 | 16 | 1 |
| 16-20 | 46 | 7 | 3 | .. | .. | 2 | .. | 3 | .. | 23 | 3 |
| 21-25 | 47 | 2 | 5 | 2 | 1 | 1 | .. | 7 | 1 | 13 | 2 |
| 26-30 | 27 | 3 | 4 | .. | .. | .. | .. | 2 | .. | 7 | 1 |
| 31-35 | 29 | 3 | 1 | .. | 1 | 1 | .. | 1 | 2 | 3 | .. |
| 36-40 | 18 | 1 | .. | .. | .. | .. | .. | 2 | 1 | .. | .. |
| 41-45 | 24 | 1 | .. | 1 | .. | 1 | .. | 1 | .. | 3 | .. |
| 46-50 | 10 | .. | .. | .. | .. | .. | .. | .. | .. | 1 | .. |
| 51-55 | 5 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| 56-60 | 3 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| 61-65 | 3 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Total.... | 311 | 38 | 19 | 11 | 3 | 10 | 1 | 35 | 8 | 67 | 7 |
| Per cent. | .. | 12.2 | 6.1 | 3.5 | 0.9 | 3.2 | 0.3 | 11.2 | 2.8 | 21.2 | 2.2 |

This patient, then, was a child who was difficult to nourish at the breast and, after some initial improvement, also on the bottle. It is difficult to decide to what the stationary weight was due. Was it the time of year—July and August? Was it an inadequate supply of the fat soluble growth factor? Was it the dyspepsia? Was it the parenteral infections? Or, was it a lack of the water soluble growth factor? Or, was it some other cause?

The lack of the water soluble growth factor can be absolutely excluded, as the giving of farina made no difference in the child's condition. If anything, the child was worse after taking it. It is also quite improbable that there existed a deficiency in the fat soluble growth factor, because practically all of the other babies were doing well at the same time, on the same amount of this growth factor, and also this child itself improved later on a mixture of half milk, which, in all probability, contained no more fat soluble growth factor than did the S. M. A., and in addition the vegetables which it received instead of improving its condition seemed to make it worse. In all probability the parenteral infections were factors, as was also the time of the year, but whether they were primary or secondary in importance is difficult to determine. Such cases as these occur at the breast, and if one studies them at all one realizes how difficult it is and, many times, how impossible it is to pick out the real etiologic factor. So we do not feel

—S. M. A.—Infants Fed for More Than Six Weeks
—V, VI, and Central)

| Sufficient Breast Milk | Follicular Enteritis | No Appetite | Died and Cause | Overage | By Mistake | Trans. to Non-S. M. A. Disp. | Trouble with Milk Delivery |
|---|---|---|---|---|---|---|---|
| 3 | .. | .. | 3 (2 Pertussis; 1 gastro-enter.) | 3 | .. | .. | .. |
| .. | .. | 1 | 3 (Pertuss.; premature; convul.) | 3 | .. | .. | .. |
| .. | .. | .. | .. ..... | 4 | 1 | .. | .. |
| 1 | .. | .. | 1 (Premature) ..... | 10 | .. | 1 | .. |
| .. | .. | .. | 1 (Diarrhea and enteritis)..... | 9 | .. | .. | .. |
| .. | 1 | .. | 1 (Follicular enteritis) ..... | 14 | .. | .. | 1 |
| .. | .. | .. | .. ..... | 14 | .. | .. | .. |
| .. | .. | .. | 2 (Intox ; pneum.) ..... | 15 | .. | .. | .. |
| .. | .. | .. | .. ..... | 9 | .. | .. | .. |
| .. | .. | .. | .. ..... | 5 | .. | .. | .. |
| .. | .. | .. | .. ..... | 3 | .. | .. | .. |
| .. | .. | .. | .. ..... | 3 | .. | .. | .. |
| 4 | 1 | 1 | 11 | 92 | 1 | 1 | 1 |
| 1.2 | 0.3 | 0.3 | 3.5 | 29.5 | 0.3 | 0.3 | 0.3 |

that the break in the rather good weight chart of the child can, with any positiveness, be put to the debit of the food. Similar cases are illustrated in Weight Charts 14 and 15.

COMMENT

Such cases show, of course, that no food is a panacea, but inasmuch as we occasionally find breast milk just as inefficient in repairing such an infant, we are justified in refusing to lay the blame of a poor result immediately and definitely and entirely to the food, especially as in our experience it has been so valuable to many infants. No one has pointed out better and more convincingly than has Schloss[13] the fact that poor nutritional results may be due to many different factors and especially to the very complex and undefinable one of environment.

We wish to emphasize that S. M. A. is not a finished product even from the standpoint of our present-day knowledge of the chemistry, biology and physics of breast milk. It does not, for instance, at the present time, include a true protein adaptation, nor is the freezing point the same as that of breast milk. We also realize that S. M. A. is not a panacea, but at the same time we are convinced from the experience we have had during the past three years that better results have

13. Schloss: Ueber Säuglingsernährung, 1912, p. 137.

TABLE 4.—Number of Patients Receiving S. M. A.

| | 100% S. M. A. | 75% S. M. A.* | 50% S. M. A.† |
|---|---|---|---|
| Disp. VI | 93 | 35 | 27 |
| Disp. V | 27 | 21 | 7 |
| Disp. IV | 25 | 26 | 8 |
| Central | 32 | .. | .. |
| Totals | 177 (57%) | 92 (29.5%) | 42 (13.5%) |
| Grand total | 311 | | |

* 75 per cent. S. M. A. and 25 per cent. breast.
† 50 per cent. S. M. A. and 50 per cent. breast.

TABLE 5.—Mortality Record and Clinical History of Eleven Fatal Cases.

| Name | Serial No. | Per Cent. S. M. A. | Condition at S. M. A. Beginning | Diseases Occurring During S. M. A. Feeding | No. Weeks On S.M.A. | No. Weeks Off S.M.A. | How Long Ill Before Death | Age at Death, Weeks | Cause of Death |
|---|---|---|---|---|---|---|---|---|---|
| N. | 47-VI | 100 A | Beading at wrists and chest; sl. scales on head | Slight exudative | 27 | 2 | 3 weeks | 36 | Lobar pneumonia |
| C. | 52-VI | 100 B | Premature | Exudative | 15 | 0 | 15 weeks | 17 | Premature (lack of care) |
| P. | 131-VI | 75 B | Good; turgor poor | Pertussis | 12 | 0 | 5 weeks | 24 | Whooping cough (City Hospital) |
| P. | 726-V | 100 B | Good; sl. eczema of face and scalp | Rhinitis | 7 | 1 | 16 days | 12 | Enteritis follicularis 1/14/17 |
| L. | 727-V | 75 A | Fair | Thrush | 12 | 0 | Suddenly | 19½ | Convulsions (3/7/17) |
| D. | 734-V | 100 B | Emaciated; premature; constip. | Slight vomiting; ulcer under tongue | 8 | 0 | 13 days | 16 | Pertussis (5/2/17) |
| S. | 752-V | 75 B | Constip.; thin; underfed | Seborrhea of scalp; cold | 42 | 0 | 5 days | 59½ | Pneumonia (excellent gain) |
| V. | 348-IV | 100 B | Turgor fair; fine condition; skin clear | Neg. | 8 | 12 | 18 weeks | 36 | Whooping cough (City Hosp.) |
| C. | 623-Cent. | 100 B | Skin red and scaly; well devel. and nour. | Catarrhal otitis media | 44 | 0 | 12 weeks | 44 | Intoxication (home condition bad) |
| S. | 641-Cent. | 100 A 31 weeks; + mixed diet for 4 weeks | Premature; weakling | Otitis media; coryza; intertrigo; exudative | 35 | 0 | 1 week | 35 | Enteritis follicularis |
| K. | 642-Cent. | 100 B | Exudative | Intertrigo | 29 | 0 | 3 weeks | 29 | Enteritis (home cond. very bad) |

| | Number S. M. A. Cases | Number Deaths | Mortality Rate |
|---|---|---|---|
| Disp. VI | 155 | 3 | 1.9% |
| Disp V | 55 | 4 | 7.2% |
| Disp. IV | 69 | 1 | 1.4% |
| Central Disp. | 32 | 3 | 9.3% |
| Total | 311 | 11 | 3.5% or 4.5% for 100% S. M. A. |

been obtained with it than with any other method which we have used. And inasmuch as it can be used for small infants, a few weeks old, as well as for older infants up to a year, without changing its character and simply by increasing or decreasing the total amount for the twenty-four hours and for the individual feedings, it appears to us to be a great factor in simplifying infant feeding and consequently in bringing into the hands of the general practitioner a food whose administration he can direct in many cases with good nutritional results. That such a step will mean much in the reduction of infant mortality, which is so essential from a national and humanitarian standpoint, there can be no doubt, and as further discoveries are made, other changes can be instituted that may make the final result still better.

## SUMMARY OF RESULTS

1. A total of 385 babies of varying ages and conditions were fed with S. M. A., in most instances with excellent results.

2. Of the 385 infants receiving S. M. A., 74 were removed from this food before the sixth week of feeding, for the following causes and in the following percentages (compare Table 2).

| | Number | Per Cent. | | Number | Per Cent. |
|---|---|---|---|---|---|
| Moved | 7 | 9.4 | Intercurrent illness | 0 | |
| Refuses to take | 10 | 13.5 | Mother indifferent | 22 | 29.2 |
| Family physician advised against | 7 | 9.4 | Did not return | 5 | 6.7 |
| Vomiting | 3 | 4 | Not gaining | 0 | |
| Dyspepsia | 7 | 9.4 | Sufficient breast milk | 4 | 5.4 |
| Unfair cases | 5 | 6.7 | No reason given | 3 | 4 |
| | | | Still on S. M. A. | 1 | 1.3 |

3. Of the patients receiving S. M. A. for more than six weeks, the following percentages were removed for the following reasons (compare Table 3).

| | Number | Per Cent. | | Number | Per Cent. |
|---|---|---|---|---|---|
| Moved | 38 | 12.2 | Not gaining | 7 | 2.2 |
| Refuses to take | 20 | 6.4 | Sufficient breast milk | 4 | 1.2 |
| Family physician advised against | 11 | 3.5 | No reason given | 0 | |
| Vomiting | 3 | 0.9 | Follicular enteritis | 1 | 0.3 |
| Dyspepsia | 10 | 3.2 | Died | 11 | 3.5 |
| Unfair cases | 0 | | Overage | 92 | 29.5 |
| Intercurrent diseases | 1 | 0.3 | By mistake | 1 | 0.3 |
| Mother indifferent | 35 | 11.2 | Transferred to non-S. M. A. Dispensary | 1 | 0.3 |
| Did not return | 8 | 2.8 | Trouble with milk delivery | 1 | 0.3 |
| Still on S. M. A. | 67 | 21.2 | | | |

4. Of the 311 cases, 177, or 57 per cent., were 100 per cent. S. M. A.; 92, or 29.5 per cent., were 75 per cent., and 42, or 13.5 per cent., were 50 per cent. S. M. A. (compare Table 4).

5. Of the 311 patients fed with S. M. A. for six weeks or more, 11 died, making a total mortality of 3.5 per cent, or 4.5 per cent, for 100 per cent S. M. A. Of these 11 cases, 5 were poor risks. Cases 52, 734, 623, 641 and 642 (compare Table 5). Of the 11 deaths, 2 were due to pneumonia, 3 to whooping cough, 3 to enteritis follicularis, 1 to intoxication, 1 to convulsions, and 1 to prematurity and weakness.

TABLE 6.—VOMITING.—
(Total for Disp. IV,—

| Length of Time On S. M. A., Weeks | 100 Per Cent. S. M. A. | | | | | | | | 75 Per Cent. S. M. A. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No. Cases | Per Cent. Patients Negative | Per Cent. Slight | | Per Cent. Medium | | Per Cent. Severe | | No. Cases | Per Cent. Patients Negative | Per Cent. Slight | |
| | | | Rare | Freq. | Rare | Freq. | Rare | Freq. | | | Rare | Freq. |
| 6-10 | 29 | 65.5 | 13.7 | 10.3 | 6.8 | 3.4 | .. | .. | 11 | 72.7 | 27.2 | ... |
| 11-15 | 29 | 82.7 | 10.3 | ... | 3.4 | 3.4 | .. | .. | 13 | 61.5 | 30.7 | ... |
| 16-20 | 21 | 80.9 | 14.2 | ... | ... | 4.7 | .. | .. | 16 | 56.2 | 37.4 | ... |
| 21-25 | 25 | 71.9 | 19.9 | ... | ... | 7.9 | .. | .. | 14 | 64.2 | 28.5 | ... |
| 26-30 | 18 | 77.7 | 16.6 | ... | ... | 5.5 | .. | .. | 8 | 87.5 | 12.5 | ... |
| 31-35 | 16 | 73.3 | 14.0 | ... | 12.4 | ... | .. | .. | 11 | 63.6 | 27.2 | ... |
| 36-40 | 8 | 62.5 | 25.0 | ... | ... | 12.5 | .. | .. | 7 | 85.7 | ... | ... |
| 41-45 | 14 | 49.9 | 42.8 | 7.1 | ... | ... | .. | .. | 8 | 74.8 | 24.9 | ... |
| 46-50 | 9 | 88.8 | ... | ... | 11.1 | ... | .. | .. | 1 | 100.0 | ... | ... |
| 51-55 | 4 | 100.0 | ... | ... | ... | ... | .. | .. | 0 | .... | ... | ... |
| 56-60 | 2 | 50.0 | 50.0 | ... | ... | ... | .. | .. | 3 | .... | 100.0 | ... |
| 61-65 | 1 | .... | ... | ... | 100.0 | ... | .. | .. | 0 | .... | ... | ... |
| Total... | 176 | 72.53 | 16.84 | 2.23 | 4.84 | 3.92 | .. | .. | 92 | 65.1 | 29.2 | ... |

* A = group under observation at dispensary while getting other food before receiving S. M. A. B = group receiving S. M. A. on admission to dispensary.

6. Vomiting: Vomiting occurred extremely rarely and was negligible as a factor in the refusal of the milk. A percentage of 72.5 of the 100 per cent. S. M. A. infants showed neither vomiting nor spitting; 16.8 per cent. showed slight vomiting or spitting rarely; in other words, 89.4 per cent. were normal in this respect, and if we add to this figure the 2.2 per cent. of frequent slight vomiting, we obtain a total of 91.6 per cent. of infants who may be justly classified as normal in this respect, leaving 8.7 per cent. of the patients whose vomiting could be called abnormal in the broad sense. None of the cases showed severe vomiting, so that the 8.7 per cent. of the cases were put into the medium class, and of these 4.8 per cent. vomited rarely and only 3.9 per cent. frequently (compare Table 6).

7. Stools: The stools in an average of 86.5 per cent. of the 100 per cent. S. M. A. patients were normal; in an average of 8.4 per cent. they were constipated; and in an average of 4.9 per cent. they were dyspeptic; in other words, entirely different than the stools obtained by Bahrdt with Friedenthal's milk and by Schloss with his whey-adapted milk containing milk sugar. This observation would seem to indicate that Schloss's assumption that the high lactose content of the food was responsible for the dyspeptic stools, the lack of appetite, and the vomiting, cannot hold good (compare Table 7).

8. Weight: The average gain of weight per week compares very favorably with that of the normal breast fed infant. It is impossible to give an accurate picture without going into detail with each child. The accompanying charts, however, show samples of the different results. By averaging the weekly gain for all of the different groups for the four different dispensaries, it is found that in every instance the average gain has been greater after the feeding with S. M. A. than was the average gain before the feeding of S. M. A., and further, the average gain in weight on 100 per cent. S. M. A. feeding is for Class A, 120.2 and for Class B, 121.4 per week, which, if applied to the birth weight of

—GROUPS A AND B *
—V, VI, and Central)

| 75 Per Cent. S. M. A. | | | | 50 Per Cent. S. M. A. | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Per Cent. Medium | | Per Cent. Severe | | No. Cases | Per Cent. Patients Negative | Per Cent. Slight | | Per Cent. Medium | | Per Cent. Severe | |
| Rare | Freq. | Rare | Freq. | | | Rare | Freq. | Rare | Freq. | Rare | Freq. |
| ... | ... | ... | ... | 7 | 57.1 | 42.8 | ... | ... | ... | ... | ... |
| 7.6 | ... | ... | ... | 8 | 50.0 | 25.0 | ... | ... | ... | ... | 25.0 |
| ... | 6.2 | ... | ... | 10 | 80.0 | 10.0 | ... | 10.0 | ... | ... | ... |
| 7.1 | ... | ... | ... | 5 | 80.0 | 20.0 | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | 3 | 33.3 | 33.3 | ... | 33.3 | ... | ... | ... |
| 9.0 | ... | ... | ... | 4 | 100.0 | ... | ... | ... | ... | ... | ... |
| ... | 14.2 | ... | ... | 2 | 100.0 | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | 2 | 100.0 | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | 0 | .... | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | 0 | .... | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | 1 | 100.0 | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | 0 | .... | ... | ... | ... | ... | ... | ... |
| 3.23 | 2.16 | ... | ... | 42 | 71.4 | 19.0 | ... | 4.76 | ... | ... | 4.76 |

This table is a condensation of author's original Tables 6 to 13 inclusive.

a child, would bring a double in from five to six months and a treble at the end of the year (compare Tables 8, 9, 10 and 11, and Charts 1 to 20, inclusive).

9. Length: Enough measurements were made to show that babies fed with S. M. A. grow like normal breast fed infants (Refer to Charts 21, 22, 23 and 24). The curves running under the normal line, especially in those coming to the Central Dispensary, are due to the fact that the infants were either premature or disturbed before being placed on S. M. A. Nearly all of them showed a good rise.

10. Hemoglobin Content and Teeth: In a group of eleven babies fed with S. M. A. from 12 to 34 weeks, mainly over 20 weeks, taken at random at one of the dispensaries, the hemoglobin determination made during May, 1918, showed normal results for every individual case: Seven showed a percentage of 80; 2 of 85; 1 of 75, and 1 of 70. All of these infants, except the two under 30 weeks of age, had teeth from 1 to 6 in number. Only two children were over 40 weeks old — one was 48, and the other 42. In another group, coming to the same dispensary at the same time, and who had been on S. M. A. in practically all instances from 20 to 30 weeks but who had not been taking it for from 4 to 34 weeks, the hemoglobin and teeth examinations showed practically the same results, giving really in 25 infants normal results. This is especially interesting in the light of our present belief that cow's milk contains less iron than breast milk; consequently S. M. A. should contain less than one-third of the amount found in breast milk, unless there is iron added to the skimmed milk as a result of the handling process in cans (Compare Tables 12 and 13).

11. Electrical Reactions: June 9, 1916, eight infants, taken at random and who had been on S. M. A. from 26 to 53 weeks, were examined for their electrical hyperexcitability and in every instance this was found normal, and during the winter months the electrical reactions of hospital babies on S. M. A.

TABLE 7.—Stools. Groups A and B*
(Total for Disp. IV, V, VI, and Central)

| Length of Time On S. M. A., Weeks | 100 Per Cent. S. M. A. | | | | | 75 Per Cent. S. M. A. | | | | | 50 Per Cent. S. M. A. | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No. Cases | Per Cent. Patients with 100% Normal | Per Cent. Normal | Per Cent. Dyspepsia | Per Cent. Constipation | No. Cases | Per Cent. Patients with 100% Normal | Per Cent. Normal | Per Cent. Dyspepsia | Per Cent. Constipation | No. Cases | Per Cent. Patients with 100% Normal | Per Cent. Normal | Per Cent. Dyspepsia | Per Cent. Constipation |
| 6-10 | 29 | 55.1 | 82.7 | 9.7 | 7.3 | 11 | 54.5 | 79.5 | 6.3 | 14.1 | 7 | 71.4 | 90.0 | ... | 10.0 |
| 11-15 | 29 | 55.1 | 89.6 | 2.9 | 7.4 | 13 | 61.5 | 92.9 | 4.3 | 2.6 | 8 | 47.5 | 70.6 | 6.8 | 22.5 |
| 16-20 | 21 | 61.7 | 83.3 | 5.2 | 11.3 | 16 | 43.1 | 76.0 | 4.7 | 18.7 | 10 | 46.0 | 88.9 | ... | 10.9 |
| 21-25 | 25 | 39.9 | 88.7 | 4.7 | 11.3 | 14 | 71.4 | 97.8 | 1.0 | 0.7 | 5 | 40.0 | 76.0 | ... | 24.0 |
| 26-30 | 18 | 49.9 | 87.5 | 2.7 | 9.7 | 8 | 50.0 | 82.5 | 3.7 | 13.7 | 3 | 66.6 | 93.3 | ... | 6.6 |
| 31-35 | 16 | 62.4 | 95.2 | 3.4 | 1.2 | 11 | 45.4 | 84.0 | 5.0 | 10.4 | 4 | 100.0 | 100.0 | ... | ... |
| 36-40 | 8 | 37.5 | 92.1 | 4.1 | 3.7 | 7 | 57.1 | 93.5 | 1.4 | 5.0 | 2 | 95.0 | 95.0 | ... | 5.0 |
| 41-45 | 14 | 14.2 | 87.6 | 5.9 | 6.0 | 8 | 50.0 | 94.9 | 0.3 | 4.6 | 2 | 100.0 | 90.0 | 5.0 | 5.0 |
| 46-50 | 9 | 22.2 | 78.2 | 1.8 | 20.0 | 1 | .... | 60.0 | 40.0 | ... | 0 | .... | ... | ... | ... |
| 51-55 | 4 | 25.0 | 86.2 | 5.2 | 8.5 | 0 | .... | ... | ... | ... | 0 | .... | ... | ... | ... |
| 56-60 | 2 | .... | 92.5 | 5.0 | 2.5 | 3 | 33.3 | 90.0 | 6.6 | 3.3 | 1 | .... | 80.0 | 10.0 | 10.0 |
| 61-65 | 1 | .... | 90.0 | 10.0 | ... | 0 | .... | ... | ... | ... | 0 | .... | ... | ... | ... |
| Total... | 176 | .... | 86.48 | 4.90 | 8.42 | 92 | .... | 87.01 | 4.04 | 8.77 | 42 | .... | 85.78 | 1.75 | 12.58 |

* A = group under observation at dispensary while getting other food before receiving S. M. A. B = group receiving S. M. A. on admission to dispensary.
This table is a condensation of author's original Tables 15 to 22 inclusive.

TABLE 8.—Average Weekly Gain in Weight in Infants Receiving 100 Per Cent. S. M. A.

| | A* | | B† |
|---|---|---|---|
| | Before S. M. A., Gm. | After S. M. A., Gm. | Gm. |
| Central Disp. | 44.4 | 124.2 | 94.8 |
| Disp. IV. | 109.0 | 113.6 | 112.3 |
| Disp. V. | 80.9 | 120.3 | 122.7 |
| Disp. VI. | 94.4 | 120.1 | 132.3 |

* A = Group under observation at dispensaries while getting other food before receiving S. M. A. † B = Group receiving S. M. A. on admission to dispensaries.

were occasionally tested without ever finding abnormal conditions. This test corresponds with the clinical observation that not one infant fed with S. M. A. milk for any length of time showed any of the clinical evidences of spasmophilia (Table 14).

12. General Appearance: The men feeding these infants, and medical visitors, are unanimous in their claim that as far as general appearance, behavior, color, firmness of the subcutaneous tissue, facial expression and actions are concerned, the babies fed with S. M. A. very much resemble breast fed babies.

13. Net Result: The physicians feeding the infants for over six weeks were asked to grade each individual case according to the following scheme: (I) excellent; (II) good; (III) fair, and (IV) poor. They rated 82.3 per cent. as excellent, 12.8 per cent. as good, 3.8 per cent. as fair, and 0.9 per cent. as poor, making really 95 per cent. good results and 5 per cent. poor results (compare Table 15).

## CONCLUSIONS

From the observations made on the 311 infants fed with S. M. A. the following conclusions seem justifiable:

1. It is possible to obtain an excellent nutritional result, according to our present standards, without the aid of butter fat in the food, if the food is similar to breast milk in its protein, carbohydrate, salt and water content, if the substituting fat contains an adequate amount of fat-soluble growth factor, and if the fat is similar to breast milk fat in other respects, namely, saponification number, iodin number, Reichert-Meissl number, and melting point, and if, further, an antiscorbutic is given with S. M. A., so long as it is manufactured as at present; that is, over the route of pasteurization or sterilization.

2. The feeding of S. M. A. was not accompanied by the development of rickets, spasmophilia, or anemia in full-term normal infants.

3. It is possible to feed, with excellent nutritional results, a large group of full-term, normal infants with S. M. A. without any qualitative change for as long a time as it is customary to keep infants at the breast.

4. This accomplishment represents a distinct advance in practical infant feeding, inasmuch as it establishes a marked simplification of feeding, especially from the standpoint of the general practitioner and the infant welfare station, and as a result of the good nutritional results obtained it represents further a substantial means for the lessening of sickness among infants, and, indirectly, of improving the health and strength of the nation.

5. The feeding of S. M. A. makes possible the saving of the entire butter supply and two-thirds of the milk supply, without excessive cost, so that, in other words, it can be made to be a factor of economic importance to the country.

6. S. M. A. simply represents the addition of fat adaptation to those already attempted and partially established in connection with

TABLE 9.—WEIGHT—
(Total for Disp. IV,—

| Length of Time On S. M. A., Weeks | 100 Per Cent. S. M. A. | | | | | | | | | 75 Per Cent. S. M. A. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Before S. M. A. Beginning | | | | | After S. M. A. Beginning | | | | Before S. M. A.— | | |
| | No. Cases | No. Weeks Between Admission and S. M. A. | Total | | Average | | No. Weeks On S. M. A. | Total Gain, Gm. | Average Gain, Gm. | No. Cases | No. Wks. Between Admission and S. M. A. | Total | |
| | | | Gain, Gm. | Loss, Gm. | Gain, Gm. | Loss, Gm. | | | | | | Gain, Gm. | Loss, Gm. |
| 6-10 | 15 | 119 | 12,860 | ... | 108.0 | ... | 117 | 15,291 | 130.6 | 5 | 35 | 3,960 | 120 |
| 11-15 | 7 | 86 | 7,372 | ... | 85.7 | ... | 90 | 12,700 | 141.1 | 6 | 71 | 6,700 | ... |
| 16-20 | 9 | 90 | 4,378 | ... | 48.6 | ... | 168 | 21,526 | 128.1 | 8 | 59 | 6,510 | 200 |
| 21-25 | 9 | 91 | 9,010 | ... | 99.0 | ... | 211 | 23,950 | 113.5 | 6 | 27 | 3,410 | 170 |
| 26-30 | 9 | 61 | 5,545 | ... | 90.9 | ... | 253 | 28,500 | 112.6 | 3 | 19 | 2,260 | ... |
| 31-35 | 6 | 35 | 1,620 | ... | 46.2 | ... | 193 | 25,860 | 133.9 | 5 | 26 | 1,950 | ... |
| 36-40 | 3 | 16 | 1,930 | 50 | 117.5 | 3.1 | 114 | 16,510 | 144.8 | 4 | 26 | 3,360 | ... |
| 41-45 | 6 | 16 | 920 | 240 | 42.5 | 15.0 | 253 | 26,420 | 104.4 | 4 | 22 | 1,010 | ... |
| 46-50 | 3 | 12 | 910 | 250 | 55.0 | 20.8 | 147 | 15,840 | 107.7 | 1 | 6 | 670 | ... |
| 51-55 | 2 | 6 | 590 | ... | 98.3 | ... | 106 | 11,750 | 110.8 | 0 | .. | .... | ... |
| 56-60 | 0 | .. | ... | ... | .... | ... | .... | ..... | .... | 3 | 5 | 550 | ... |
| 61-65 | 1 | 1 | 76 | ... | 76.0 | ... | 65 | 8,194 | 126.0 | 0 | .. | .... | ... |
| Total... | 71 | 533 | 44,671 | ... | 83.8 | ... | 1,717 | 206,541 | 120.2 | 45 | 296 | 29,890 | ... |

TABLE 10.—WEIGHT RECORD. GROUP B*
(Total for Disp. IV, V, VI, and Central)

| Length of Time On S. M. A., Weeks | 100 Per Cent. S. M. A. | | | | 75 Per Cent. S. M. A. | | | | 50 Per Cent. S. M. A. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No. Cases | No. Weeks On S. M. A. | Total Gain, Gm. | Average Gain, Gm. | No. Cases | No. Weeks On S. M. A. | Total Gain, Gm. | Average Gain, Gm. | No. Cases | No. Weeks On S. M. A. | Total Gain, Gm. | Average Gain, Gm. |
| 6-10 | 14 | 111 | 11,950 | 107.6 | 6 | 48 | 7,260 | 151.2 | 3 | 26 | 5,220 | 201.1 |
| 11-15 | 22 | 259 | 36,884 | 138.5 | 7 | 87 | 6,710 | 77.3 | 3 | 44 | 6,550 | 148.8 |
| 16-20 | 12 | 218 | 27,900 | 129.0 | 8 | 141 | 20,650 | 146.4 | 4 | 74 | 13,770 | 186.1 |
| 21-25 | 16 | 372 | 44,900 | 117.9 | 8 | 177 | 30,970 | 174.9 | 2 | 43 | 6,460 | 150.2 |
| 26-30 | 9 | 254 | 31,540 | 124.1 | 5 | 136 | 17,170 | 126.2 | 1 | 29 | 3,010 | 103.8 |
| 31-35 | 10 | 333 | 45,110 | 135.4 | 6 | 196 | 28,500 | 145.4 | 1 | 33 | 6,380 | 193.3 |
| 36-40 | 5 | 191 | 23,250 | 121.7 | 3 | 109 | 9,480 | 86.9 | 1 | 39 | 2,760 | 70.7 |
| 41-45 | 8 | 350 | 33,300 | 95.1 | 4 | 174 | 18,530 | 106.4 | 1 | 44 | 5,680 | 129.1 |
| 46-50 | 6 | 283 | 35,630 | 125.9 | 0 | ... | ..... | .... | .. | .. | ..... | .... |
| 51-55 | 2 | 104 | 13,210 | 127.0 | 0 | ... | ..... | .... | .. | .. | ..... | .... |
| 56-60 | 2 | 117 | 11,210 | 95.8 | 0 | ... | ..... | .... | .. | .. | ..... | .... |
| Total... | 106 | 2,592 | 314,884 | 121.4 | 47 | 1,068 | 139,270 | 130.4 | 16 | 332 | 49,840 | 150.1 |

* B = Group receiving S. M. A. on admission to dispensary.
This table is a condensation of author's original Tables 25, 27, 29, 31.

—Record. Group A*
—V, VI, and Central)

| 75 Per Cent. S. M. A. | | | | | 50 Per Cent. S. M. A. | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| —Beginning | | After S. M. A. Beginning | | | | Before S. M. A. Beginning | | | After S. M. A. Beginning | | |
| Average | | | | | | | | | | | |
| Gain, Gm. | Loss, Gm. | No. Weeks On S. M. A. | Total Gain, Gm. | Average Gain, Gm. | No. Cases | No. Weeks Between Admission and S. M. A. | Total Gain, Gm. | Average Gain, Gm. | No. Weeks On S. M. A. | Total Gain, Gm. | Average Gain, Gm. |
| 109.7 | 3.4 | 38 | 3,520 | 92.9 | 4 | 28 | 2,650 | 94.6 | 33 | 5,210 | 173.6 |
| 94.3 | ... | 80 | 10,790 | 134.8 | 5 | 13 | 2,120 | 163.0 | 67 | 10,192 | 152.1 |
| 110.3 | 3.4 | 144 | 20,970 | 145.6 | 6 | 35 | 3,400 | 97.1 | 111 | 14,300 | 128.8 |
| 126.2 | 6.3 | 140 | 30,910 | 220.7 | 3 | 8 | 780 | 97.5 | 67 | 9,750 | 145.5 |
| 118.9 | ... | 82 | 10,960 | 133.6 | 2 | 5 | 470 | 95.0 | 57 | 6,370 | 111.7 |
| 75.0 | ... | 162 | 20,410 | 125.9 | 3 | 17 | 1,450 | 85.2 | 98 | 14,020 | 143.0 |
| 129.2 | ... | 150 | 30,420 | 202.8 | 1 | 1 | 70 | 70.0 | 39 | 6,450 | 165.2 |
| 45.9 | ... | 170 | 22,790 | 134.0 | 1 | 6 | 1,330 | 223.3 | 43 | 4,180 | 97.2 |
| 111.6 | ... | 50 | 4,480 | 89.6 | 0 | .. | .... | .... | ... | .... | .... |
| .... | ... | ... | ..... | .... | 0 | .. | .... | .... | ... | .... | .... |
| 110.0 | ... | 179 | 19,150 | 106.8 | 1 | 7 | 1,870 | 267.1 | 57 | 6,530 | 114.5 |
| .... | ... | ... | ..... | .... | 0 | .. | .... | .... | ... | .... | .... |
| 100.9 | ... | 1,195 | 174,400 | 145.6 | 26 | 120 | 14,140 | 118.7 | 572 | 77,002 | 134.7 |

* A = Group under observation at dispensary while getting other food before receiving S. M. A. This table is a condensation of author's original Tables 24, 26, 28 and 30.

TABLE 11.—Average Weekly Gain of Normal Infants for Different Age Periods

| Weeks.... | 1-4 | 5-8 | 9-13 | 14-17 | 18-21 | 22-26 | 27-30 | 31-33 | 34-39 | 40-43 | 44-47 | 48-52 | 53-56 | 57-60 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 203.0 | 196.0 | 186.6 | 165.5 | 153.4 | 140.6 | 133.5 | 128.2 | 123.3 | 120.1 | 114.8 | 112.0 | 107.3 | 104.3 |
| 2 | ..... | 189.0 | 178.5 | 153.0 | 141.0 | 128.2 | 122.0 | 117.5 | 113.3 | 110.8 | 106.1 | 103.5 | 99.8 | 96.7 |
| 3 | ..... | ..... | 168.0 | 135.0 | 125.0 | 113.0 | 108.6 | 105.6 | 102.5 | 101.1 | 96.8 | 94.9 | 91.7 | 89.0 |
| 4 | ..... | ..... | ..... | 102.0 | 103.5 | 94.6 | 93.7 | 93.2 | 91.6 | 91.2 | 88.0 | 86.7 | 84.1 | 81.9 |
| 5 | ..... | ..... | ..... | ..... | 105.0 | 91.0 | 91.0 | 91.0 | 89.6 | 89.8 | 86.0 | 84.8 | 82.1 | 79.9 |
| 6 | ..... | ..... | ..... | ..... | ..... | 77.0 | 84.0 | 86.3 | 85.6 | 86.8 | 82.8 | 82.0 | 79.2 | 77.0 |
| 7 | ..... | ..... | ..... | ..... | ..... | ..... | 91.0 | 91.0 | 88.6 | 89.2 | 84.0 | 83.0 | 79.5 | 77.0 |
| 8 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 91.0 | 87.5 | 88.8 | 82.2 | 81.2 | 77.6 | 75.0 |
| 9 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 84.0 | 87.5 | 82.6 | 81.2 | 75.0 | 72.5 |
| 10 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 91.0 | 77.0 | 77.0 | 72.7 | 70.2 |
| 11 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 63.0 | 70.0 | 66.6 | 65.0 |
| 12 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 77.0 | 68.5 | 65.6 |
| 13 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 60.0 | 60.0 |
| 14 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 60.0 |

MONTHS

TABLE 12.—Showing Percentage of Hemoglobin and Number of Teeth in a Group of S. M. A. Babies Taken at Random at Dispensary VI on Three Consecutive Days (May, 1918)
Still on S. M. A.

| Number Patient | Serial Number | Weight, Gm. | Age, Weeks | Number Weeks On S. M. A. | Per Cent. of Hemoglobin | Number Teeth | | Result, I-IV |
|---|---|---|---|---|---|---|---|---|
| | | | | | | In | Coming | |
| 1 | 187 | 8,080 | 37 | 26 | 80 | 3 | .. | I |
| 2 | 173 | 9,100 | 48 | 34 | 75 | 4 | 2 | I |
| 3 | 197 | 7,350 | 34 | 27 | 80 | 2 | .. | I |
| 4 | 167 | 8,770 | 36 | 32 | 80 | 4 | .. | I |
| 5 | 175 | 8,890 | 38 | 26 | 85 | 4 | 2 | I |
| 6 | 206 | 8,650 | 31 | 23 | 70 | 1 | 1 | I |
| 7 | 196 | 6,430 | 31 | 27 | 85+ | 1 | .. | I |
| 8 | 212 | 7,490 | 29 | 22 | 80 | 0 | .. | I |
| 9 | 213 | 4,700 | 19 | 12 | 80 | .. | 2(?) | I |
| 10 | 200 | 9,200 | 42 | 12 | 80 | 6 | 2 | I |
| 11 | 203 | 7,570 | 30 | 26 | 80 | 6 | .. | I |

TABLE 13.—Showing Percentage of Hemoglobin and Number of Teeth in a Group of S. M. A. Babies Taken at Random at Dispensary VI on Three Consecutive Days (May, 1918)
Taken off S. M. A.

| Number Patient | Serial Number | Weight, Gm. | Age, Weeks | Number Weeks On S. M. A. | Number Weeks Off S. M. A. | Per Cent. of Hemoglobin | Number Teeth | | Result, I-IV |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | In | Coming | |
| 1 | 174 | 8,020 | 38 | 30 | 8 | 85 | 0 | ... | I |
| 2 | 137 | 9,450 | 50 | 30 | 10 | 70 | 6 | ... | I |
| 3 | ... | 8,980 | 77 | 8 | 34 | 75 | 10 | ... | I |
| 4 | 128 | 8,750 | 56 | 21 | 17 | 80 | 10 | ... | I |
| 5 | 115 | ..... | 56 | 38 | 11 | 75 | 5 | ... | I |
| 6 | 184 | 8,520 | 42 | 17 | 16 | 70 | 4 | ... | I |
| 7 | 138 | 11,080 | 56 | 26 | 17 | 75 | 4 | ... | I |
| 8 | 139 | 10,000 | 42 | 33 | 4 | 80 | 4 | ... | I |
| 9 | 142 | 9,530 | 56 | 26 | 13 | 75 | 8 | ... | I |
| 10 | 124 | 10,570 | 56 | 33 | 13 | 80 | 8 | ... | I |
| 11 | 108 | 12,300 | 65 | 30 | 22 | 80+ | 7 | ... | I |
| 12 | 180 | 8,080 | 52 | 21 | 10 | 85 | 2 | ... | I |
| 13 | 136 | 9,410 | 60 | 14 | 20 | 70 | 12 | ... | II |
| 14 | 164 | 8,820 | 52 | 30 | 4 | 85 | 8 | ... | I |

TABLE 14.—ELECTRICAL REACTIONS ON BABIES FED WITH S. M. A. (JUNE 9, 1916)

| Serial Number | Disp. | Number Weeks On S. M. A. | A. C. C. | A. O. C. | K. C. C. | K. O. C. |
|---|---|---|---|---|---|---|
| 17 | VI | 42 | 4.0 | 5.0 | 3.5 | 10 |
| 15 | VI | 34 | 3.75 | 9.0 | 3.0 | 9 |
| 10 | VI | 53 | 2.5 | 8.75 | 1.75 | 10+ |
| 710 | V | 47 | 3.0 | 4.25 | 2.75 | 9 |
| 712 | V | 26 | 5.0 | 10.0 | 2.0 | 10 |
| 716 | V | 38 | 5.5 | 10.0 | 4.0 | 10+ |
| 617 | Central | 38 | 2.0 | 5.0 | 1.75 | 8+ |
| 628 | Central | 34 | 3.0 | 8.0+ | 2.0 | 8+ |

TABLE 15.—NET RESULT IN INFANTS FED WITH S. M. A.

| | Total S. M. A. Cases | I | | II | | III | | IV | |
|---|---|---|---|---|---|---|---|---|---|
| | | No. | Per Cent. | No. | Per Cent. | No. | Per Cent. | No. | Per Cent. |
| Disp. VI..... | 155 | 129 | 83.2 | 20 | 12.9 | 5 | 3.2 | 1 | 0.6 |
| Disp. V..... | 55 | 44 | 80.0 | 8 | 14.5 | 1 | 1.8 | 2 | 3.6 |
| Disp. IV..... | 69 | 60 | 86.9 | 6 | 8.6 | 3 | 4.3 | .. | ... |
| Central..... | 32 | 23 | 71.8 | 6 | 18.7 | 3 | 9.3 | .. | ... |
| Total..... | 311 | 256 | 82.3 | 40 | 12.8 | 12 | 3.8 | 3 | 0.9 |

I = Excellent. II = Good. III = Fair. IV = Poor.

sugar, water, protein and salts. It is, of course, not a finished product, and simply represents one step of many more that must be made before we can really speak of an adapted milk with much justification.

7. In making the fat adaptation in S. M. A. the idea of rickets prevention has also been included by the incorporation into the fat of a liberal amount of cod liver oil.

We wish to express our appreciation of the careful help given us in the statistical work by Miss Ina Clark and Miss Mary Shelais, members of The Babies' Dispensary and Hospital staff under Miss Margaret Hope.

# A METHOD FOR THE DETERMINATION OF FAT IN DRIED FECES AND ITS DISTRIBUTION AS SOAP, FREE FATTY ACIDS AND NEUTRAL FAT

## AN APPLICATION TO FECES OF THE ROESE-GOTTLIEB METHOD FOR DETERMINING FAT IN DRIED AND CONDENSED MILKS *

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ANGELIA M. COURTNEY AND HELEN L. FALES
NEW YORK

The investigation of the fat metabolism of infants and young children has been for some time an important subject of study in this laboratory. In furtherance of it, a large number of stools have recently been collected from the wards of the hospital, from other institutions and from various private patients. Careful data have been obtained regarding the food of the patients from whom stools were collected and so far as possible representative samples of the daily food were procured for analysis. Total fat has been determined in food and feces, and in the latter the distribution of the fat as soap, free fatty acids and neutral fat. In most cases total ash and calcium content of food and feces were also determined. The results of these investigations have been incorporated with many analyses which we had obtained in previous metabolism studies. It is our intention to present in a series of papers these data and to discuss their bearing on various problems of fat metabolism in infants and young children, especially the relation of the amount and the kind of the fat in the food to the quantity and distribution of the fat in the feces and the influence of fat on calcium metabolism.

In this preliminary paper we present the method used in obtaining the fat values. Previous to the autumn of 1915 a modification of the Soxhlet method was used for fat determination in this laboratory. This method has numerous disadvantages. It involves a forty-eight hour extraction with an elaborate equipment, which requires much attention. Moreover, in order to obtain complete extraction of the fat it is necessary to use very small quantities of material with a consequently high percentage error. The need of a shorter and simpler method led us to apply to the study of feces the Roese-Gottlieb method for the determination of fat in dried and condensed milks,

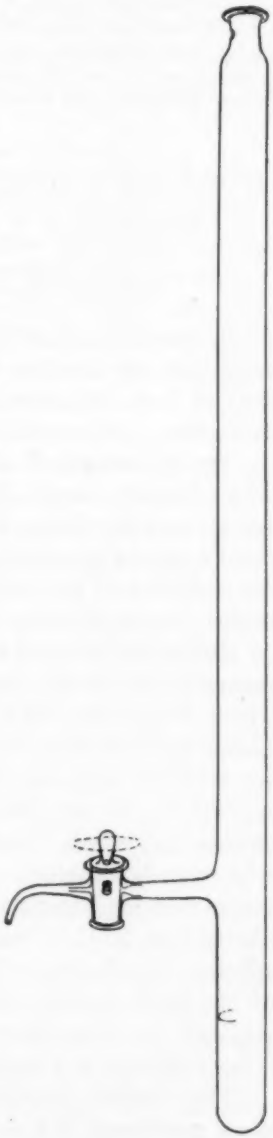
* Submitted for publication Nov. 13, 1918.
* From the Laboratories of the Rockefeller Institute and the Babies' Hospital.

as practiced in the Dairy Laboratory, Bureau of Chemistry, Department of Agriculture.[1]

As adapted to the determination of total fat and fat distribution in feces, the method which we have employed, is as follows:

METHOD

One-gram samples of thoroughly dried and powdered material are weighed into small evaporating dishes. One half of these samples are used for the determination of total fat and the other half for the determination of the unsaponified fat; that is, the neutral fat and the free fatty acids. To each sample which is to be used for the determination of total fat there is added about 10 c.c. of dilute hydrochloric acid (one part of concentrated hydrochloric acid to three parts of water) and to those which are to be used for the determination of the unsaponified fat there is added the same volume of water; that is, about 10 c.c. The dishes are then placed on a water bath and left there until the contents are thoroughly heated and disintegrated. The homogeneous mixture from each dish is then transferred to a Röhrig tube (see illustration) and washed in, first with sufficient water to bring the contents of the tube exactly to a mark designating half the capacity of the portion below the faucet, then with 95 per cent. alcohol until the tube is filled to the level of the faucet. There is then added 25 c.c. of ethyl ether, free from nonvolatile matter, and the tube is shaken vigorously for a half minute; there is then added 25 c.c. of petroleum ether, boiling below 60 C., and the tube is again shaken for a half minute. The mixture is allowed to stand until the upper liquid is perfectly clear. The layer of ether, containing the extracted fat, is then drawn off by the faucet through a quick acting filter paper into a bottle of known weight. To make the extraction complete the process is repeated with 20 c.c. of both kinds of ether. For extreme accuracy a third extraction is made with 30 c.c. of the mixed ether, which has been recovered from previous determinations. To insure against loss of fat, the tip of the faucet, the funnel and filter paper are washed with about 10 c.c. of mixed ether.



The ether is distilled from the combined extracts by means of an electric stove. The distillate, composed of mixed ethyl and petroleum ether, is condensed and used for further determinations. The fat residue is dried over night on a water bath, then for several hours in an oven at 98 C., desiccated and weighed.

1. Patrick: Roese-Gottlieb method. Circular 66, U. S. Dept. of Agric., Bureau of Chem.

In order to determine the free fatty acids the extract from the nonacidified samples is used. After the fat has been dried and weighed, it is dissolved in benzol, heated and titrated while very hot with tenth-normal alcoholic sodium hydrate. Phenolphthalein is used as an indicator and the titration is carried to the maximum color. The alkali used is standardized by stearic acid, dissolved in hot benzol.

The difference in weight between the extract from the acidified material (the total fat) and that from the nonacidified material (the neutral fat and free fatty acids) is the weight of soap fat. The difference between the weight of the nonacidified extract and the weight of the free fatty acids, computed from titration figures, represents the neutral fat. The following is an example:

| | Gm. |
|---|---|
| A. Weight of extract from acidified sample | 0.38 |
| B. Weight of extract from nonacidified sample | 0.24 |
| Difference between A and B = fat as soap | 0.14 |
| C. Titration of B.....6.0 c.c. | |
| Equivalent weight of free fatty acid | 0.17 |
| (1 c.c. tenth-normal NaOH = 0.0284 gm. stearic acid.) | |
| Difference between B and C = neutral fat | 0.07 |

In the Roese-Gottlieb method ammonia is used to facilitate the separation of the fat from the protein. This step is necessarily omitted in the determination of fat in feces on account of the presence of the free fatty acids, which would be saponified by the ammonia.

The advantages of this method for fat determination are evident. The technic is simple, the amount of ether required for each determination is not large, that is, it can be distilled off quickly, and the results can be obtained in from eighteen to twenty-four hours from the weighing of the samples. Moreover, the method gives the distribution as soap fat, free fatty acids and neutral fat.

Considerable confusion exists in regard to the interpretation of reported figures for fat in feces because of the different methods which have been used. Two, which have been much quoted, the Liebermann-Székely[2] and the Kumagawa-Suto[3] methods, give a value for total fat only, stated in terms of fatty acids. This is obtained by saponifying the fat, then splitting it with acid before extracting with alcohol and ether. The extract obtained is purified by reextracting with petroleum ether. The Kumagawa-Suto method gives higher values than most methods, because the extract is never heated in drying higher than 50 C. Thus the lower fatty acids are in part held in the extract. As the lower fatty acids arise mainly from the carbohydrate of the food, results which include them are not to be desired in a study of fat metabolism, especially since their separate determination is very difficult and doubtful.

The Gephart-Czonka[4] method involves the same principles as those mentioned, but the fatty acid value is obtained by titrating the

2. Liebermann and Székely: Pflüger's Arch. f. d. ges. Physiol., **72**:360, 1898.
3. Kumagawa and Suto: Biochem. Ztschr., **8**:212, 1908.
4. Gephart and Czonka: Jour. Biol. Chem., December, 1914.

petroleum ether extract instead of by weighing. This method requires considerable manipulation and the use of large quantities of ether. As in the methods just described, only total fat, as fatty acids, is obtained. These three methods avoid the slight objection which might be raised in regard to our own procedure, in which the total fat is weighed and reported as a mixture of fatty acids and neutral fat. This is not, however, of any practical importance, since the difference between the weight of the neutral fat and its corresponding fatty acid is so slight that the total fat value is not affected to the extent of 1 per cent. of the usual amounts weighed.

Folin and Wentworth[5] also obtain their figures in this form, that is, the total fat as a mixture of fatty acids and neutral fat, and they obtain a value for the neutral fat by titrating the fatty acids and subtracting the result from the total fat. They claim that there is no significance in a figure for soap fat as separate from fatty acids, since both in the intestines and during the drying of the feces on the water bath "numerous different factors of no particular bearing on fat metabolism will materially affect the equilibrium between the soap fat and the fatty acids." Our experience, however, in the study of infants' stools of various types has led us to the conclusion that in spite of these objections the soap fat value, as determined, may be of significance in a study of fat metabolism. For this reason we feel strongly the advantage of a method by which it is possible to obtain this value.

In modifying the Roese-Gottlieb method so as to obtain the fat separation, use has been made of the Folin-Wentworth procedure for titrating the fatty acids. As a matter of convenience sodium hydrate dissolved in 95 per cent. alcohol and standardized by stearic acid is used instead of sodium alcoholate. The solution we use quickly becomes cloudy from contact with the glass container, so that frequent restandardization is necessary.

Various authors believe that the ether extract of acidified material includes substances other than fat, notably coloring matter. Ordinarily the extract which we obtain is clean, homogeneous, mainly crystalline and dissolves clear in any of the fat solvents. Occasionally there is an appearance of sediment in the extract and in some cases, especially in the stools of breast fed infants, the extract shows marked color. In such cases the dried extract is dissolved in mixed ether and again filtered before drying and weighing. If care is taken to prevent drawing off any of the watery portion from the tube with the ether, the need of filtering will be lessened. This is very desirable since slight mechanical loss in the second filtration is scarcely avoidable.

5. Folin and Wentworth: Jour. Biol. Chem., **6**:421, 1910.

The completeness of extraction has been tested with samples of stearic acid, saponified stearic acid and mixtures of these. In every case the recovery was 99 per cent. or more. In order to make sure that the results do not include the acids formed from carbohydrate, weighed samples of stearic acid were dissolved in mixed ether, lactic and acetic acid added and the whole evaporated on a waterbath, dried and weighed. Invariably only the stearic acid remained.

It is not claimed that the method here described gives results with an average error less than 1 per cent. The fat forms so large a proportion of the dried feces that the homogeneity of the sample is of great importance. When the fat amounts to 50 per cent. of the dried weight of the feces, there may be variations of 5 per cent. in duplicate analyses. This extreme error is largely due to the fact that stools with so large a proportion of fat are gummy and impossible to powder.

In some respects our method resembles that described by Saxon.[6] His method gives the distribution as fatty acids, soap fat and neutral fat and he extracts by shaking. His determination is made on moist fresh feces and he does not use mixed ethers. The use of the Röhrig tubes in the Roese-Gottlieb method greatly facilitates the manipulation.

6. Saxon: Jour. Biol. Chem., **17**:99, 1914.

# CLINICAL DEPARTMENT

## OBSERVATIONS ON A CASE OF RUMINATION WITH SUGGESTIONS AS TO TREATMENT*

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The subject of rumination has been discussed in the literature for years. Many of the articles consist of case reports with a discussion of some particular phase of the condition. In this way the literature has been reviewed in a fractional manner, each case report being the nucleus for a discussion of similar cases previously reported. Einhorn,[1] in 1890, reviewed the literature more thoroughly and brought the knowledge of the subject up to date. It was our purpose in connection with the report and discussion of this case to review the literature since 1890. This, however, is found to be impossible, inasmuch as the majority of the seventy-five references collected are found to be buried in unobtainable foreign literature. We will, at the close of this article, attempt to give briefly the important points in the literature which we have been able to review.

### REPORT OF CASE

*History.*—E. D., aged 7 months, was brought into the outpatient department of the Harriet Lane Home, Sept. 7, 1915, by her mother who said that during the previous four months the baby had been "bringing back food into her mouth and reswallowing it."

*Family History.*—The mother, aged 18, was thin and frail but said that she was well and had never had any "nervous trouble." She was married at 18; before that time she had worked in a factory. She seemed bright and of normal intelligence. The father, aged 25, was in the hospital with a recurring femoral osteomyelitis. He was thin and tuberculous looking although no demonstrable tuberculous lesions were found. His Wassermann test was negative. The patient was the only child; there had been no other pregnancy.

*Personal History.*—The birth of the child was normal as was also her development. She had always nursed normally. She held up her head at 3 months, cut her first teeth at 7 months. She was now able to sit up alone, reach for things and pick up objects with both hands. There was no history of convulsions, infectious diseases, gastro-intestinal disturbances or illnesses of any kind. The child had been breast fed at irregular intervals and had often been given pieces of bread "to chew." The child had never had any "pacifiers" and had never shown any tendency toward finger sucking. She had never been

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* From the Harriet Lane Home of the Johns Hopkins Hospital.

1. A review of recent literature and list of references will be found at the end of the article.

a mouth breather. During the first three months nothing abnormal was noted. There was said to have been no vomiting or "spitting up" of food.

*Present Illness.*—When 3 months old, the child began to bring up food into her mouth, "work on it" for a time and then reswallow it. This procedure occurred soon after each nursing, or even while at the breast, and kept recurring at intervals for a period of one to two hours. If the head was held in such a position as to permit spilling, loss of food resulted. The mother said that the baby brought up in this way not only milk but also other fluids such as water, fennel tea, cascara, etc. The mother thought the condition was as marked at the time it was first noticed as at the examination. She also said that the child had become thin and attributed this to the loss of food.

*Physical Examination.*—The baby was a fairly well nourished child, though somewhat underweight, weighing 11 pounds 9 ounces. She was bright and happy and watched her surroundings with interest. She showed a tendency to grasp objects with her left hand rather than with her right. Her body seemed well proportioned. The fontanel was open, small and not bulging. The eyes reacted to light and accommodation. There was no strabismus. There was no apparent nasal obstruction. Examination of the mouth showed two lower middle incisors. The throat looked normal, with the tonsils not enlarged. There was no abnormal amount of adenoid tissue present. No glandular enlargement was evident; the epitrochlears were not palpable. The thorax was well-shaped with no evidence of rachitis. The lungs and heart seemed quite normal. The abdomen showed no distention; there were no masses felt; the liver was of normal size; the spleen was not palpable. There was no evidence of peristaltic waves after feeding. The extremities were in all respects normal, with no suggestion of epiphyseal thickening or any other evidence of rachitis. The muscle tone seemed quite normal. The skin was soft and showed no abnormalities. There were no signs of tetany; no positive Chvostek; no carpopedal spasm; no increase in electrical excitability. An examination of the nervous system, in so far as it was possible in so young a child, showed no abnormalities; sight and hearing, taste and smell seemed normal; there was no evidence of sensory or motor disturbances; no absence of normal reflexes; no clonus present.

*Management.*—The child was at once put on four-hour nursings. For a few days she was followed in the dispensary and then brought into the hospital. In the ward she was put on four-hour feedings of cow's milk. The mixture at first consisted of equal parts of milk and thin barley water and was later increased to two parts of milk to one of thick barley water. At first 4 ounces were given at a feeding; later the amount was increased to 5 ounces.

When free from attacks the baby acted in a perfectly normal manner, extending her hands for everything in sight, watching those about her in an interested manner and eagerly accepting her feedings. The child would rest comfortably in her mother's lap with her head supported against her mother's arm; or else lie in bed with her legs extended and usually crossed at the ankles, and with her arms resting beside her and so flexed that the hands were usually on a level with her shoulders. Suddenly this apparently normal baby would raise her forehead and eyebrows and, becoming rigidly extended, would throw back her head, arch her chest, contract her abdomen and open her mouth wide (Fig. 1). Coincidently milk would gush up into the mouth and rhythmically rise and fall from the pharynx into the mouth for a varying number of times. While this was happening she watched observers in a disinterested manner or else gazed vacantly into space.

As the attack ceased the fluid was either swallowed or lost from the mouth. The child then breathed deeply, made a few chewing movements and again acted in a perfectly normal manner. These attacks were so typical of rumination as to leave no doubt as to the diagnosis.

The attacks came with an almost definite regularity, from eight to ten minutes after the beginning of a feeding. If food was given sufficiently fast so that all of it was taken within this interval of time, the child would be free from attacks while being fed; if feeding extended over a longer period, the child, whether at the breast or the

Fig. 1.—This picture, taken while the child was ruminating, shows the characteristic posture—the mouth wide open, the head thrown back, the thorax arched and the abdomen contracted. The tongue can be seen protruding to the lower lip. The flexion of the forearm was very constantly present. Because of the strong sunlight, the eyes are closed here.

bottle, would suddenly throw back her head and ruminate. Rumination continued for two to two and a half hours after a feeding, the attacks coming more frequently during the first part of this period and less frequently toward the end. On an average fifteen attacks occurred during the first half hour and from fifteen to twenty attacks during the following one and one half or two hours (Table 1). The attacks varied in duration from fifteen to thirty-five seconds; the majority

lasted from eighteen to twenty-five seconds; abortive attacks of only three or four seconds occasionally occurred.

In an attack the fluid welled up from the pharynx into the mouth a varying number of times and at an average rate of once a second (Table 1). Frequent pauses, however, occurred in this rhythm. After the fluid had welled up four or five times in a perfectly regular manner, it would be held in the pharynx for a second or two before it would again gush up into the mouth. Often as many as seven or eight pauses occurred in a single attack. Those coming during the latter part were generally of slightly longer duration than the earlier ones and were more conspicuous.

The sequence of events in these attacks was so rapid that it was difficult to assign priority to some of them. It seemed as though at the time the face assumed its characteristic expression, the abdomen was coincidentally contracted and the chest arched. Then the head was thrown back as the fluid gushed into the mouth.

By watching the abdomen it was found that contraction of its musculature occurred just prior to the appearance of the regurgitated milk in the buccal cavity. No peristaltic waves were ever noticed, but a definite epigastric bulging was occasionally seen. Sometimes two or three such bulgings appeared and disappeared during a single attack; then again, none at all was observed during several attacks.

Immediately after the assumption of the characteristic opisthotonic position, the regurgitated fluid would be seen welling up into the wide-open mouth. Its appearance was at times preceded by or associated with an eructation. Gas bubbles were often, though not constantly, seen with the first gush of fluid. The milk would be forced up from the pharynx into the mouth, striking the uvula and hard palate, showering over the tongue and draining back again into the pharynx, whence it would be immediately forced forward in a similar manner. During the attack the ruminated fluid became filled with air bubbles.

The mouth, which during an attack was always held wide open, became even more widely opened with each forward flow of the fluid. Although to accomplish this the lower jaw had to be moved, it is interesting to note that this slight movement did not lessen the jaw rigidity. Any effort to close the mouth resulted in failure unless surprisingly strong force was exerted upward on the lower jaw. The floor of the mouth, palpated from the outside, was of almost board-like hardness and the neck felt as though every muscle was in contraction.

As the lower jaw moved up and down, the tongue moved as a part of it. It seemed to have no independent motion, although its posterior

TABLE 1.—Showing the Time of Occurrence after Feeding of the Attacks of Rumination

| | Time, P. M. | Rumination | Rhythmical Movements | Duration, Seconds |
|---|---|---|---|---|
| Nursing began | 1:00 | | | |
| | 1:08 | + | 6 | 5 |
| | 1:10 | + | 17 | 15 |
| | 1:11 | + | 24 | 20 |
| | 1:12 | + | 20 | 15 |
| End of nursing | 1:15 | + | 28 | 22 |
| Curds brought up | 1:17 | + | 22 | 23 |
| Spilling of food | 1:19 | | | |
| | 1:22 | + | 28 | 24 |
| Rectal gas passed | 1:23 | + | 23 | 20 |
| | 1:26 | + | 43 | 35 |
| Eructations (between attacks) | 1:27 | + | 17 | 12 |
| | 1:30 | + | 35 | 30 |
| | 1:31 | + | 17 | 15 |

A typical series of ruminating attacks such as occurred after each feeding. Note the number of the attacks, their duration and their frequency. During the succeeding hour and a half fifteen similar attacks occurred.

TABLE 2.—Influence of Plugging the Nostrils on Occurrence of Rumination

| | Time, P. M. | Rumination | Rhythmical Movements |
|---|---|---|---|
| Nursing began | 1:45 | | |
| | 1:53 | + | 8 |
| | 1:54 | + | 7 |
| | 1:55 | + | 5 |
| | 1:56 | + | 4 |
| | 1:58 | + | 2 |
| Nursing ended | 1:59 | + | 3 |
| | 2:02 | + | 2 |
| Cried for ten minutes | 2:12 | + | 8 |
| | 2:20 | + | 8 |
| | 2:23 | + | 16 |
| | 2:26 | + | 22 |

Ruminating attacks as they occurred when the child was made a temporary mouth breather by obstructing her nostrils. The duration of the attacks is seen to be definitely shortened although their frequency remains uninfluenced. In the succeeding two hours sixteen attacks occurred, in which there were generally only two or three rhythmical movements, although the number occasionally ran as high as eighteen or twenty.

TABLE 3.—Effect of Forcibly Checking the Attacks of Rumination

| | Time, A. M. | Rumination | Rhythmical Movements |
|---|---|---|---|
| Nursing began | 11:00 | | |
| | 11:09 | + | 4 |
| | 11:11 | + | 3 |
| | 11:12 | + | 2 |
| | 11:12½ | + | 1 |
| Nursing ended | 11:15 | + | 2 |
| | 11:17 | + | 2 |
| | 11:22 | + | 2 |
| | 11:29 | + | 3 |
| | 11:34 | + | 3 |
| | 11:37 | + | 5 |
| | 11:39 | + | 3 |
| | 11:42 | + | 3 |

Ruminating attacks as they occurred when there was a systematic forced closure of the jaws at the beginning of each attack. A few rhythmical jaw movements regularly occurred before it was possible to break the rigid jaw extension and so bring the attack to a close. Although the attacks were in this way aborted, their frequency was unaffected. Rumination as a rule ceased in forty-five to sixty minutes instead of occurring over a period of two or two and a half hours.

portion, which was held elevated, seemed to fall slightly just before the fluid welled up from the pharynx into the mouth. The tip of the tongue lay well forward. Its lateral edges were curled up so as to make a trough out of the anterior portion of the tongue. Into this much of the fluid ran after it was showered down from its contact with the hard palate.

During rumination the child never became actually cyanotic, although her face became increasingly red. Just before the fluid appeared in the mouth, a deep breath was always taken and the thorax was held in the inspiratory position during the entire attack. During the pauses in the attack there were irregular thoracic movements such as occur with respiration. At the close of rumination several hurried inspirations were taken before normal respiration was resumed.

It was interesting to attempt to trace a relationship between the physical findings and the causative factors producing them. These thoracic movements were the first to be investigated. At first we considered them respirations, although the presence of fluid in the pharynx made breathing apparently impossible. Chest tracings were difficult because of the activity of the child and good ones were not obtained. Even poor ones, however, give a clue to the probable condition, especially when studied in connection with the simultaneously taken jaw tracings. It can be seen in the accompanying tracings (Fig. 2) that the child took a deep breath just at the onset of the attack, so that she started with her lungs well filled. The whole tracing shows that the general tendency of the thoracic line is downward — as though air were slowly leaving the thorax. The superimposed curves on this "thoracic base line" give some idea of the extent of the thoracic movements and emphasize the difficulty in attempting to reach a decision by observation of the chest alone. These curves show also that thoracic movements occurred irregularly during the attacks and were not limited to the period of the pauses. They were, however, less marked at other times and were clinically overlooked until their presence was revealed by the chest tracings. Evidently, then, there were no inspirations during an attack. These movements may perhaps be considered reflex respiratory movements, although no air was available, occurring in response to the body's need for more oxygen.

Whether any air actually left the lungs, we could not decide. This led to attempted investigations as to the source of the air so constantly seen mixed with the ruminated fluid. Did it come from the lungs, or the stomach? Could the decreasing thoracic line on the tracings be interpreted to mean that a certain amount of air was being forced from the lungs by the muscular contractions and admixed with the fluid in the pharynx? We were not able to prove this point, although

it seems plausible to suppose that this might have been the source for at least part of the air. We have already said that there were at times epigastric bulgings very suggestive of a temporarily distended stomach. Definite eructations were also often observed during attacks, as well as between them. Flatus was frequently passed. All these findings pointed very strongly to an increased amount of gas in the stomach. The fact was further emphasized by the finding of much gas in the empty stomach, as was repeatedly proved by passage of a stomach tube before feeding. Although we were sure that gas did at times come from the stomach during rumination when eructations were distinctly heard, we could not tell what happened when no eructations were heard, and yet the ruminated fluid continued to be mixed with bubbles. Did the air come up noiselessly at times, or could there have been an admixture of milk with the surrounding air in the mouth as the result of the rather violent muscular activity on the viscid fluid? This latter possibility appears plausible and offers a suggestion as to the source of the increased stomach gas. Regardless of the source of the air, much gas must have been swallowed with the returned fluid at the close of each attack. Whether any air was also swallowed at the time of feeding could not be determined, although we were rather impressed by the fact that there seemed to be evidence of less stomach gas after quick feedings than after slow ones.

Rumination is naturally divided into three parts: regurgitation; rumination proper, that is, the working on the regurgitated food in the mouth and pharynx; and reswallowing. The last needs no discussion, inasmuch as there is no reason to believe its mechanism to be other than that of normal swallowing. Regurgitation must be similar to vomiting — a propulsion of the stomach contents into the mouth. In the rigid opisthonic position which the child assumed, the abdomen was held contracted and the musculature was felt to be tense. The increased stomach gas would have increased the gastric tension. This tension would have been further intensified by the pressure of the contracted abdominal muscles when the child became rigid and opisthotonic. Furthermore, with the thorax held in the inspiratory position, the intra-abdominal pressure would have been still more increased by pressure from the descended diaphragm. In the thorax, with the chest held in the inspiratory position and the glottis closed (because of the fluid in the pharynx), there must have been an increase in the negative intrathoracic pressure with the resulting decrease in the positive pressure in the esophagus. Such conditions would facilitate the return of food from the stomach to the pharynx, the decreased esophageal pressure acting by suction and the increased stomach tension acting by propulsion. It was difficult to determine whether the stomach musculature itself played a part in the regurgitating act. We attempted

to study the effect of epinephrin by dropping a few minims into the regurgitated fluid at a time when the attacks were occurring every two or three minutes. All rumination was checked for ten or fifteen minutes, but there also occurred such marked hiccoughing as to vitiate the results. Neither was any help given by fluoroscopy, for the light and noise of the procedure caused an immediate cessation of each attack. Roentgen-ray plates gave only negative information and failed to show any evidence of muscular contractions.

The importance of the probable increase of gastric gas in the production of regurgitation is uncertain. Would the effect of the increased abdominal pressure on the stomach have been sufficient to produce regurgitation without an increase in the stomach tension produced by the gas? If the stomach was freed from gas before feeding, and the milk was then given quickly so as to prevent any possibility of air swallowing, there was a period of ten or fifteen minutes following feeding in which rumination did not occur; following that interval attacks occurred but were less long and less frequent. Checking the first ruminating attempts immediately following a feeding tended to check subsequent attacks. Expelling gas after a feeding by postural devices — such as placing the baby over a shoulder or letting her sit up and bend forward — always resulted in immediate, repeated eructations and a decrease in the subsequent attacks.[2] These points, though not conclusive, offer strong circumstantial evidence as to the importance of the presence of stomach gas in rumination.

If the mechanism of rumination proper, the action of the muscles in regulating the flow of the fluid in the mouth and pharynx, could be as easily explained, there would be little need for further comment. How was the fluid forced forward and backward? Why was the jaw held rigidly extended? Why was there a synchronous movement of the lower jaw with each forward gush of the flush? Why was the tongue posteriorly elevated and anteriorly guttered? These are questions which naturally presented themselves to anyone who watched the child ruminate.

During an attack the neck and the floor of the mouth were felt to be definitely rigid, as though the whole musculature of those regions was in a state of contraction. The exact action of the larynx was difficult to determine in so young a child, but the impression was gained that it descended with each rhythmical forward flow of the fluid. It is probable that with each gush of milk into the mouth there was a constriction of the pharynx which acted with propulsive force by decreasing the size of the pharynx and so forcing the food

2. In these attempts the eructations were almost always accompanied by regurgitations, and much food was lost because of the posture, so that clinically there was no hope of applying this principle as a therapeutic measure.

forward. Contraction of the pharyngeal muscles, however, tends to elevate the larynx. It is possible to suppose that in the general muscular contraction of the neck muscles, the pull of the sternothyroid was sufficient to overbalance that of the other muscles and so cause a descent of the larynx. It was not possible to determine whether the periodic change in the size of the pharynx was in any way affected by the position of the tongue. The posterior portion of the tongue seemed to be depressed rhythmically just prior to the welling up of the fluid. If this were true, it may have helped in decreasing the amount of pharyngeal space and so have helped in forcing the fluid forward.

The action of the lower jaw in its position of rigid extension with superimposed rhythmical movements is interesting. These movements could not be considered rudimentary attempts at chewing or suckling for the mouth was held continually wide open, and with each movement it was momentarily opened still wider. This is so dissimilar to the jaw activity in chewing and suckling as to make it necessary to find another explanation for their occurrence. With each forward flow of fluid from the pharynx into the mouth, the lower jaw became still more widely extended and immediately swung back through the reverse motion as the fluid ebbed back into the pharynx. This made it seem as though the movements of the lower jaw were directly associated with the pharyngeal contractions. It is conceivable that with the hyoid bone fixed, as must surely have been the case, there may have been a certain amount of backward pull on the jaw with each pharyngeal contraction, resulting in these movements. If this were true, the motion of the jaw would be of no primary importance and would merely be dependent on the essential pharyngeal muscular activity.

The pauses occurring during the attacks, when the fluid was temporarily held in the pharynx, are perhaps best explained on the basis of fatigue. The fact that they were so much more prominent toward the end of the attack would lend strength to this supposition.

The significance of the position of the tongue is also highly conjectural. Lying as a part of the floor of the mouth with the lower jaw held extended, it is easy to imagine the pull on the styloglossal fibers with the resultant elevation of the edges of the tongue and the production of the medial trough. The genioglossal, with its fibers producing a forward pull on the tongue and a depression of its central parts, also undoubtedly took part in the muscular contractions. Why this position should have been assumed must remain unanswered. Whether it represented a position similar to that in suckling, or whether it was merely secondary to the fundamentally important pharyngeal contractions, is not clear. All these theories, based on incomplete evidence, are at best only speculative. It did seem as

though the pharyngeal contractions must have been of fundamental importance in the propulsion of the food forward from the pharynx into the mouth. The case reported by Wanitchek in which rumination ceased after a diphtheritic pharyngeal paralysis would certainly lend evidence in favor of this view. It was also interesting to discover that a forced closure of the rigid jaws caused an instantaneous cessation of an attack. Ability to propel the fluid forward seemed to be lost when the jaws were no longer extended.

### CLINICAL CONSIDERATION

After making these observations, we became interested in some of the clinical questions which have been raised in connection with rumination. The subject of the hydrochloric acid content of the stomach has received much attention. Many cases have been treated with hydrochloric acid because of the supposed acid deficit. In the literature one finds a divided opinion. The majority report a definite hypochlorhydria or even achlorhydria, while still others, without being specific as to the food given before testing, refer to no such deficit. In this case curds were returned with the regurgitated fluid so regularly and so quickly — generally in about fifteen minutes after the onset of feeding — as to make us feel confident of the presence of rennet ferment and to question the possibilitiy of a decreased hydrochloric acid content. Using Töpfer's and Gunzberg's reagents, we made frequent tests on samples of the ruminated fluid and were surprised to obtain negative tests for acid on all occasions. Questioning our reagents, we tried them out with distilled water to which known hydrochloric acid was added and had positive results. Then adding hydrochloric acid to some milk in a test tube we repeated the tests and found them constantly negative. The following outline will show conclusively why with milk feedings there have been reported so many cases of hydrochloric acid deficit.

Test tube A, 5 c.c. distilled water plus 3 drops of Töpfer's reagent.
Test tube B, 5 c.c. breast milk plus 3 drops of Töpfer's reagent.
Test tube C, 5 c.c. of cow's milk plus 3 drops of Töpfer's reagent.

One drop of tenth-normal hydrochloric acid added to test tube A gave a typically positive reaction for free hydrochloric acid.

Twenty-two c.c. of tenth-normal hydrochloric acid added to test tube B were needed before the slightest suggestion of a color change occurred.

Ten c.c. of tenth-normal hydrochloric acid added to test tube C were required to give the first color change.[3]

3. Gunzberg's reagent showed the color changes a little sooner—breast milk, 16 c.c., cow's milk, 8 c.c.

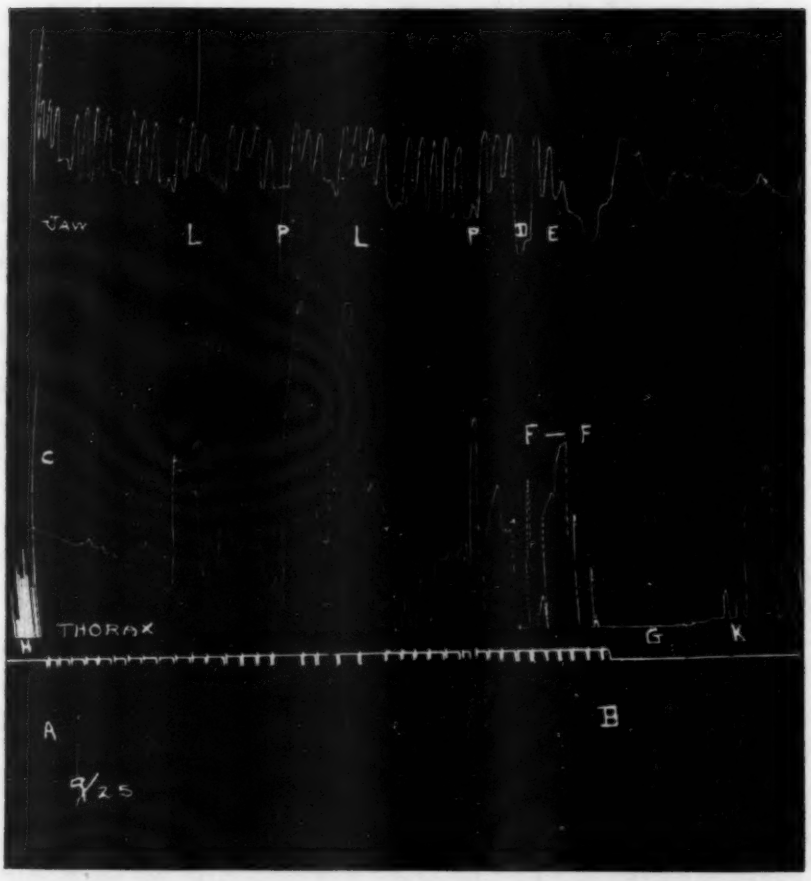


Fig. 2.—Kimographic record showing simultaneously obtained jaw and thoracic tracings. These were taken by placing an inflated rubber belt around the thorax and another around the head, passing under the jaw and over the top of the head. These belts were connected by means of tubing to the kimograph in such a manner that each downward movement of the lower jaw and every increase in thoracic circumference produced upward flings of their respective levers. The drum was made to revolve slowly until the onset of a ruminating attack. The top tracing records the jaw movements; the middle one, the thoracic movements; the lowest one marks the time in seconds. A, represents the onset of the attack; B, its cessation; D, reswallowing.

The thoracic tracing shows the following points: (1) The preceding normal inspirations (H); (2) the initial inspiration (C); (3) the inspiratory position of the chest (whole tracing); (4) the convulsive chest movements superimposed on this position (whole tracing); (5) the decrease in the inspiratory position during the attack (whole tracing); (6) the deep inspirations immediately after swallowing (F-F); (7) the respiratory pause following these inspirations (G); (8) the onset of normal respirations (K).

The jaw tracing shows the following points: (1) The series of rhythmical downward movements of the lower jaw (L); (2) the pauses between these movements (P); (3) the jaw movements following swallowing associated with collecting particles of food from the mouth (E).

From these findings it is evident that a normal flow of 0.3 per cent. hydrochloric acid in the stomach would never be detected by the usual methods of hydrochloric acid determination in 4 or 5 ounces of woman's milk or cow's milk. The buffer action of milk is well known, but this small clinical adaptation has apparently been overlooked and has resulted in faulty diagnoses and unnecessary medication.

The psychologic aspect of rumination has received surprisingly little attention. A review of the literature results in information which may be summarized in a few words. Numerous cases are reported associated with various mental disturbances ranging from hysteria to dementia precox. One reads that it is "often seen in the children of neurasthenics"; that it is a "motility disturbance"; that "it may be inherited"; "may be acquired by copying"; "is often seen in idiots and imbeciles." No one apparently has followed cases of rumination to see what happens in later life, whether these babies develop into normal adults or show later manifestations of a neuropathic constitution. Schütz and Kreuzfuchs, von Gulat and others, in reporting adult cases in which rumination had continued since childhood, do not go into the psychologic findings. From the study of this case a definite underlying psychic element seemed evident. It was observed constantly. If the child was happy, she ruminated freely. Crying spells or any other expression of anger produced a check on her rumination. Any sensory impression which was strong enough to claim her attention had also a definite inhibitory effect. The light and noise of fluoroscopy, the ringing of a bell, the clapping of hands before her face, painful sensations such as pin pricks, all were effective in aborting attacks. Many of these stimuli, however, after repetition evidently lost their power to interest and were no longer effectual. Even her sly manner of watching for an opportunity to escape detection by beginning to ruminate as soon as the observer's back was turned emphasizes the psychic element. The child undoubtedly found rumination pleasant. Her whole appearance gave the impression of enjoyment. We found that by adding a few drops of liquid quinin to the first returned fluid she would make a grimace and then quickly swallow. Rumination was by this means prevented for from one to two hours, after which time a few attacks occurred. During the time of suppression, fluid was occasionally brought up but quickly swallowed, the facial expression being very suggestive of the probable taste of the returned fluid. The question is, of course, whether rumination should be added to the list of those other habits or practices such as thumbsucking, hair pulling, tics and masturbation, which are found so constantly in individuals with a neuropathic constitution; whether it may perhaps be used as an index of such a condition. If so, it would probably be one of the

earliest manifestations, and recognition of its significance would be important, inasmuch as by proper hygiene and training much might be accomplished in preventing later manifestations of the inherent weakness. In this case there was a tendency to left handedness, which, though in itself of little importance, when taken in conjunction with still another deviation from the normal, would probably be significant. It will be of interest to know what future development will show in this child.[4]

The question may be raised as to the correctness of the term "rumination" or "merycismus" (from the Greek, meaning "to chew") as applied to this condition. In animals rumination consists in regurgitation, chewing and reswallowing, with chewing as the essential feature. In this pathologic condition in infants there is no evidence of any chewing movement. The jaws are held constantly extended

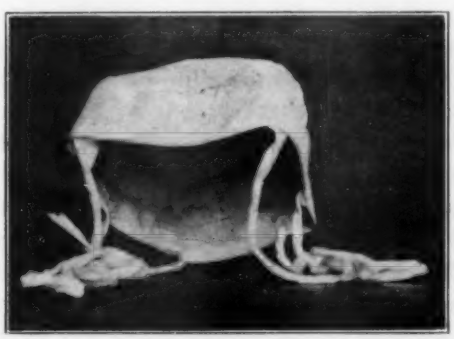

Fig. 3.—A picture of the canvas cap which was used effectually in checking rumination. The simple arrangement of the three pairs of tapes is easily seen. When the cap was fitted to the child's head the tapes were tied tightly under the chin, thus making it impossible to extend the lower jaw and in this way preventing rumination from occurring.

and the milk is forced into the mouth, to return immediately to the pharynx. Of course, in infancy suckling movements take the place of chewing, and the argument might be brought forward that the rhythmic movements seen in the attacks bear a similar ontologic relationship to chewing as does suckling. This does not seem true. In this case these movements were twice as rapid as the child's nursing movements. Furthermore, the muscular action differed markedly from that of nursing; here the food was forced rhythmically forward and fell back passively, whereas in nursing there is a rhythmic, active

4. A year and a half later the mother reports the child as being in every way normal. There has never been any return to rumination. The child has developed no new habits. The tendency to use the left hand has been overcome.

propulsion of the fluid backward into the pharynx. The name seems to have been applied merely because the condition is associated with a return of food from the stomach to the mouth with a subsequent reswallowing, without any consideration of the muscular activity taking place in the mouth.

We soon tried to influence rumination by feeding changes. Solid food therapy has long been known to be effectual. We gave cereals, which had been cooked so as to be quite solid, and were able to prevent rumination for half an hour after a feeding. Then there would occur infrequent short attacks. It seemed apparent that it was necessary to reduce the food to a liquid state before the attacks could occur. With milk feedings followed by cereal there was also a partial cessation, but not of so long duration as when fluid was entirely eliminated from the feeding. We fed milk thickened with corn starch, with results dependent on the amount of thickening. We tried this to see if it would be of practical value in cases in which, because of age or other considerations, cereal feeding was inadvisable. It is undoubtedly true that we could have cured the child by the prescribed method of solid food therapy.

Influenced, however, by our chance discovery that closure of the jaws caused immediate cessation of attacks, we hoped to devise some mechanical means for stopping rumination. Strauss, in 1915, reported a case in which the patient was cured by plugging the nostrils, thus interfering with respiration. We tried to follow his suggestion and found that although the length of the individual ruminating attacks was definitely decreased by this method, there was no influence exerted on the number of the attacks. This fact is emphasized by a comparison of Tables 1 and 2. The first shows the characteristic frequency and duration of the attacks when there was no interference to rumination, the second represents the typical findings when the child's nostrils were plugged. The baby seemed annoyed by her failure to breathe through her nose and appeared unable to handle effectually the deep inspiration taken at the onset of rumination. We felt that the decrease in the length of the attacks was dependent on the decreased amount of air taken in at the onset of an attack and perhaps also on the change in mood caused by the plugging of her nostrils. After repeated trials we felt that, though definite alleviation undoubtedly resulted, there was nothing to suggest a real cure.

We then tried checking each attack at its onset by forcing the jaws closed. It was not necessary to close them tightly — merely to break the rigid extension of the lower jaw. Generally three to four ruminating movements occurred before it was possible to accomplish this. By this process we could abort each attack although the frequency

remained practically unchanged. Table 3 shows what happened when each attack was checked as quickly as possible by breaking the rigid extension of the lower jaw. The child screamed with rage each time we interfered, but unfortunately her exhibition of temper was of only momentary duration and did not become a factor in lengthening the intervals between attacks. The child grew very wary and required the closest watching. The minute the observer's attention was directed elsewhere, she would attempt to ruminate. We felt that psychically her repeated failure to ruminate had an effect on shortening the duration of rumination after feeding. Instead of having attacks occurring for a period of two or two and one-half hours, she generally ceased her attempts to ruminate after from forty-five to sixty minutes. Further experiments with this method cut down the number of attacks still lower, but complete cessation never occurred. Feeling, however, that the mere mechanical closure of the jaws could be used as a therapeutic measure, we attempted to devise some method along this line whereby we would be able to check rumination completely. We were able to do this by fitting a canvas cap to the child's head and tying it tightly under her chin, making it impossible for her to extend her lower jaw. The photograph (Fig. 3) shows the simple construction of the cap with the three pairs of tapes leading from it; these by being tied under the chin were the means of holding up the lower jaw. We found tapes to work better than a comfortable chin pad because of the discomfort they caused when she attempted to pull against them. Because of this discomfort she grew less persistent in her efforts to work loose the cap. In using the cap we fed the child rather rapidly, so as to prevent attacks occurring during her feeding, and then quickly put on the cap and tied the tapes tightly under her chin. It was necessary to have the cap securely tied so that it could not be worked off by head movements. We kept the cap on for two hours after each feeding. During that time it was often necessary to tighten the tapes two or three times. With the tapes tight it was impossible for attacks to be initiated, so that no rumination occurred. On one or two occasions the child ruminated a few times after the removal of the cap. Within four days after beginning this method of treatment we had the condition so well checked that we felt the child could be treated as well at home as in the hospital. She was discharged Sept. 29, 1916. Her weight at that time was 11 pounds 13 ounces, a gain of 4 ounces over her entrance weight. The mother was given explicit directions as to the method of applying the cap — to feed the child quickly, to tie the cap on as tight as possible, to see that it remained tightly tied, to remove it after a period of two hours. During the next few days she reported daily that there was no evidence of rumination. After

five days she began to remove the cap sooner after each feeding, making the child wear it for only an hour and a half. Gradually even this period was shortened until, two weeks after the child had gone home, the cap was no longer needed. Up to the present, May, 1917, there has been no recurrence of rumination. Two months after rumination had ceased, her weight was 15 pounds 9 ounces, a gain of nearly 4 pounds in nine weeks.

It will be interesting to know if other cases of rumination will respond so readily to this form of treatment. If so, it should prove to be a convenient therapeutic measure and one which may be of special practical value in children with whom solid food therapy is not advisable.

### OTHER CASES OF RUMINATION OBSERVED

Rumination is not a very uncommon condition. In the interval which has elapsed since studying this case in September, 1915, to the present, January, 1918, there have been ten cases in the Harriet Lane home. Of these, one died from other causes, one was not permitted to remain for study and treatment, six responded to solid food therapy, and two failed to improve satisfactorily with food therapy but were definitely benefited by the use of the restraining cap. A brief outline of these cases follows:

B. T., white, boy, aged 5 months, admitted Dec. 8, 1916, died Jan. 2, 1917.

The child was brought to the hospital extremely ill and died as the result of conditions not at all related to the one under present consideration. Definite rumination was noticed during the child's stay in the hospital; the necropsy showed no anatomic cause for it.

M. B., white, girl, aged 4 months, admitted Aug. 29, 1917, taken away Sept. 23, 1917.

History of vomiting since 2 months of age. Brought to the hospital because of acute intestinal indigestion. Gastric peristalsis was at times seen; no other evidence of pyloric stenosis was found. Rumination was definite but slight. Because of the severe intestinal condition, a study of the rumination was delayed and the child was taken home before treatment for it had been begun. The child has not been seen since the date of discharge.

J. H., white, girl, admitted Aug. 11, 1915, for malnutrition; thereafter discharged and readmitted repeatedly.

Immature baby with many illnesses. At 5 months rumination was discovered and checked in two weeks with solid food therapy. Rumination has not occurred since that time.

F. P., white, boy, aged 10 months, admitted June 13, 1917, discharged June 27, 1917.

History of vomiting since birth, but more pronounced during the last two months before admission, causing emaciation. Rumination definite. Marked general improvement under solid food therapy, with rumination rapidly brought under control. During the two weeks spent in the hospital there was a gain in weight from 12 pounds 12 ounces to 14 pounds 8 ounces.

G. H., white, girl, aged 5 months, admitted July 27, 1917, discharged Oct. 29, 1917.

Syphilitic parents. Badly fed. History of always having vomited. Brought to hospital because of acute intestinal indigestion. Emaciation was marked. Rumination definite. Gastric peristalsis was seen at times, but no other evidences of pyloric stenosis were found. After the intestinal condition had improved, solid food therapy readily controlled rumination. The child gained 1 pound 6 ounces while in the hospital.

W. J., white, boy, aged 6 months, admitted Sept. 5, 1917, discharged Dec. 19, 1917.

History of a convulsion at 4 months. Brought to hospital because of double mastoiditis. Rumination was discovered and checked completely by solid food therapy. There was a gain in weight from 7 pounds 6 ounces at entrance to 9 pounds 9 ounces at time of discharge. After leaving the hospital, feeding regulations were not followed and the child again began to ruminate.

S. N., colored, boy, aged 4 months, admitted Sept. 27, 1917, discharged Nov. 22, 1917.

Improper feeding, malnutrition, double otitis media, history of vomiting. Rumination was definite and was checked by solid food therapy with a resultant improvement in the general condition. There was a gain in weight from 6 pounds 10 ounces at the time of entrance, to 7 pounds 13 ounces at the time of discharge.

M. O., white, girl, aged 9 months, seen in the dispensary Dec. 28, 1917, and again one week later.

History of vomiting. Typical rumination seen while the child was in the dispensary. The mother claimed this to be the characteristic type of vomiting. Semisolid food advised and a week later the mother reported marked improvement. There was a gain of 1 pound 13 ounces during this time.

M. R., white, girl, aged 10 months, admitted Nov. 2, 1917, discharged Dec. 20, 1917.

History of vomiting since 2 months of age, ruminating in character, becoming increasingly severe and causing emaciation. Solid food therapy gave only very slight benefit and the child's condition remained serious. Following the use of the restraining cap, the child gained 2 pounds in two weeks and rumination was checked.

I. S., colored, girl, aged 7 months, admitted Nov. 28, 1917.

Mother very neurotic. Child ruminated badly. Semisolid food retained in stomach until it became so fluid that rumination was possible; this after from one and one-half to two and one-half hours. Even when the cap was applied the child regurgitated food that escaped through the nose. There was no rumination when attention was diverted. The mother was therefore instructed to pick child up two hours after feeding semisolid food and if an attempt was made to ruminate, to divert her attention in some way. This method was entirely successful and child ceased ruminating and gained weight rapidly.

## REVIEW OF AVAILABLE RECENT LITERATURE

EINHORN[5] reports rumination in two adult cases. He gives a general discussion of the condition, including a description of the mechanism in animals, and a summary of the opinions concerning its etiology, the importance of various physical findings and the therapy. He lays emphasis on the underlying nervous element and believes that slight pathologic conditions may often act as the exciting factor in producing the condition, but should not be considered the fundamental cause. There is a good bibliography.

HAMMOND[6] gives a case report of rumination in an adult of abnormal mentality. After trephining, there was improvement in the mental condition and

5. Einhorn, M.: Rumination in Man, Med. Rec., **37**:554, 1890.
6. Hammond, W. H.. Merycism, New York Med. Jour., **60**:109, 1894.

cessation of rumination. He considers hasty eating and insufficient mastication as important etiologic factors.

RIESMAN[7] in an excellent article gives a review of the knowledge and theories concerning rumination. He gives a full report of the condition in two adults. In both cases there was a history of rapid eating and excessive protein intake, and in both he found a deficit in the gastric hydrochloric acid. He thinks the condition is primarily a neurosis and considers its frequent occurrence among educated people as significant. Full bibliography.

ABRAMS'[8] article is the report of a clinical demonstration of a man of 20 who had acquired phenomenal control over his diaphragm in a long continued effort to expel gastric gas. Because of this muscular control, he was able to displace his viscera in a spectacular manner and could ruminate at will. Emphasis is laid on the position of the stomach assumed when rumination was to take place. No discussion. No bibliography.

RUNGE[9] reports rumination in three generations of the same family. He found no physical abnormalities and no "neurasthenic" taint. He considers the condition not a pathologic entity, but rather a physiologic anomaly, atavistic in nature. No bibliography.

MINASSIAN[10] gives the case history of an adult ruminator. He found an achlorhydria, and treatment with hydrochloric acid resulted in cessation of rumination. He considers a neurosis to be the underlying cause. No bibliography.

SOMERS[11] reports a case in a child of 5. Physical examination revealed hydrocephalus and a deficient mentality. Improvement in the mental condition as well as a decrease in rumination resulted after "proper treatment." He considers a neuropathic constitution as the important causative agent in the rumination. No bibliography.

HALLIDAY[12] discusses rumination in himself. He believes there is a neuropathic background for the condition but considers that the practice is an effort on the part of nature to stimulate reflexly the gastric secretions.

SINKLER[13] considers the condition in man mechanically identical with rumination in animals. He gives a short review of the knowledge of animal rumination. He quotes Blanchard when he expresses his own opinion in believing that the condition in man is evidence of "human evolution." Just as in earlier times carnivorous animals had to gulp their food hastily, run to safety and there remasticate, so man in this age of hurry is being forced to adopt this same method. He reports one typical and two atypical cases. He thinks a neuropathic diathesis is the fundamental cause of the disorder and that imitation, heredity and slight physical disorders may serve as direct exciting factors. Short bibliography.

PETER[14] reports rumination in an adult of a nervous constitution. The practice began in childhood accidentally, was voluntarily repeated because found to

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7. Riesman, D.: Merycismus, or Rumination; with a Report of Two Cases, J. Nerv. & Ment. Dis., **22**:359, 1895.

8. Abrams, A.: A Case of Gastroptosis and Merycismus, with Voluntary Dislocation of the Stomach and Kidney, Med. News, **66**:405, 1895.

9. Runge, E. C.: Three Cases of Hereditary Rumination, Boston M. & S. J., **2**:515, 1895.

10. Minassian, H. A.: A Case of Merycism, Med. Rec., **51**:842, 1897.

11. Somers, L. S.: Merycism, Med. Rec., **51**:554, 1897.

12. Halliday, A.: The Condition of the Gastric Secretions in Merycism, Med. Rec., **52**:48, 1897.

13. Sinkler, W. S.: Rumination in Man, J. A. M. A., **31**:834, 1898.

14. Peter, L. C.: Rumination in a Boy of Nine Years, Pediatrics, July, 1899, p. 70.

be enjoyable and soon became an involuntary procedure. By means of suggestion and sedatives the patient became entirely cured. He thinks its occurrence is based on a nervous origin.

LINCOLN[15] discusses the three allied conditions — eructation, regurgitation and rumination—considering diagnosis, etiology, treatment and prognosis. He emphasizes the importance of heredity and imitation as stimulating factors in the production of all three conditions. He defines rumination as a "motor dynamic affection of the stomach." No bibliography.

SPIVAK[16] gives four brief case reports of aerophagia. His consideration of rumination is slight. Good bibliography.

STRAUCH[17] reports a case of rumination in a nursling in whom a cure was effected by interference with nasal breathing. He gives a careful consideration of the subject and reviews the important facts given in the earlier literature. There is a very short bibliography.

GRULEE[18] reports six cases and emphasizes the frequency of the condition and its seriousness in severe cases. He thinks pylorospasm and duodenal ulcer probably play an etiologic rôle. He discusses briefly the symptomatology and treatment, laying stress on the need of treatment of the psychic condition of the child.

FREYHAN[19] reports rumination in a man of 67 in whom the condition had persisted for a period of thirty-seven years, beginning at the time of complete dental extraction. There was a long history of hasty eating. No anatomic cause for rumination could be found and it is explained as being a "Magenneurose" with a relaxed cardia and altered chemical contents of the stomach as contributory factors.

SINGER[20] gives an excellent paper which includes four full case reports, full discussion of the theories regarding the causation and mechanism of rumination and also a good review of the literature with a full bibliography. He feels that rumination and regurgitation should be considered identical; that rumination is an expression of a nervous constitution with insufficiency of the cardia of definite but secondary importance. Any abnormal stomach findings he considers accidental. He believes that in his cases the insufficiency of the cardia had been caused by hasty eating associated with the swallowing of large pieces of food.

DECKER[21] reports five cases—four in adults, one in a child. He considers gastric dilatation, cardiac relaxation, hyperacidity and insufficient mastication to be of etiologic importance. He thinks the condition in most cases is primarily a neurosis, but admits the possibility of abnormal findings in the central nervous system in a few cases. He gives a good bibliography.

NAECKE[22] discusses rumination in himself. He believes the condition to be a motor reflex neurosis and in his case can trace nervous influences from his

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15. Lincoln, H. W.: Eructation, Regurgitation and Rumination, Med Jour., **1**:424, 1900.

16. Spivak, C. D.: Tympanities, Eructation, Merycism, Aerophagia, Colorado Med. Jour., December, 1904, p. 417.

17. Strauch, A.: Rumination in Infancy, J. A. M. A., **65**:678, 1915.

18. Grulee, C. G.. Rumination in the First Year of Life, AM. J. DIS. CHILD., **14**:210, 1917.

19. Freyhan: Ein Fall von Rumination, Deutsch. med. Wchnschr., October, 1891, p. 1147.

20. Singer, G.: Die Rumination beim Menschen und ihre Beziehung zum Brechact, Deutsch. Arch. f. klin. Med., **51**:472, 1893.

21. Decker, J.: Fünf Fälle von Ruminatio humana, München. med. Wchnschr., **1**:361, 1892.

22. Naecke, P.: Die Rumination, ein seltenes und bisher kaum beachtetes Symptom der Neurasthenie, Neurol Centralbl., 1893, 2.

mother and can see the aggravation in his condition from all causes which produce nervous exhaustion.

BAECKLIN[23] considers regurgitation rather than rumination. He discusses especially the mechanism in returning the food into the buccal cavity. Hyperacidity and pylorospasm he believes to be important causative factors. He gives a small bibliography.

MUELLER[24] reports three adult cases—in a father and his two sons—in whom the condition had persisted since childhood. He considers a neuropathic constitution as the basis for the condition and believes it an expression of an atavistic tendency. His bibliography collects familial cases and a few others which show a definite neuropathic background.

WIRTZ[25] gives an adult case report and has collected over thirty similar cases that had persisted from childhood. He thinks a nervous constitution is the important factor in the causation of the condition and considers any abnormal physical findings as of slight importance. His bibliography contains the references to the numerous articles which he discusses.

LUST[26] reports a case in a child of 7 months, in whom no abnormality could be found except absence of free hydrochloric acid. He found no evidence of peristaltic waves, but later at necropsy there was found evidence of increased pyloric contraction. He believes a motility neurosis to be the primary cause of the condition. Bibliography. (Not reviewed from the original articles.)

MAYERHOFER[27] cured rumination in a breast fed child by giving sticky food. He considers relaxation of the cardia as the chief cause. Bibliography. (Not reviewed from original articles.)

SLUKA[28] makes a brief report on a ruminating child of 14 months in whom the condition had been noticed since 6 months of age. A speedy improvement followed food regulation.

ASCHENHEIM[29] gives the case reports of rumination in two nurslings, both of whom showed evidence of a neurotic constitution and had definite symptoms of pylorospasm and also rachitis. He thinks pylorospasm and habitual vomiting represent varying degrees of the same pathologic process, and believes that either of them may be the basis for rumination if the nervous constitution of the child permits. He believes the emphasis laid on insufficiency of the cardia as a causative factor in producing the condition is misplaced inasmuch as it alone without a marked irregularity of stomach motility could be of no importance. He collects cases of rumination associated with pylorospasm and his bibliography contains many such references, the majority of which are not available at present.

VON GULAT[30]-WETTENBURG report a spectacular case in a man of 65, who ruminated gold fish and frogs for a livelihood. He had been a ruminator since childhood. A son and uncle also ruminated. Roentgen-ray examina-

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23. Baecklin, D.: Einige Bemerkungen über das Regurgitieren, Arch. f. Verdauungskr., 1899, p. 327.

24. Mueller, L. R.: Bericht über eine Wiederkäuerfamilie. Also a "Nachschrift," München. med. Wchnschr., 1902, pp. 1293 and 1503.

25. Wirtz, A.: Ueber Rumination in Säglings u. späteren Kindesalter, München. med. Wchnschr., **1**:960, 1910.

26. Lust: Zur Pathogenese der Rumination im Säuglingsalter, Monatschr. f. Kinderh., **10**:6, 1911.

27. Mayerhofer: Ges. f. inn. Med. u. Kinderh., January, 1912.

28. Sluka, E.: Wien. klin. Wchnschr., **25**:288, 1912.

29. Aschenheim, E.: Rumination und Pylorospasmus, Ztschr. f. Kinderh., 1913, **8**, No. 2, p. 161.

30. Von Gulat-Wettenburg: Ein ausserordenlicher Fall von menschlichen Wiederkauen, München. med. Wchnschr., **2**:2568, 1913.

tions detected no abnormalities. Chemical analyses showed achylia and revealed the fact that the food had been only slightly masticated and had been swallowed in large pieces. No discussion.

BRÜNING[31] reports a case of rumination in a 3-months-old child and reviews the articles dealing with six other cases in infancy. He thinks a motility neurosis is the cause of the condition, with a functional pylorospasm and a relaxed cardia perhaps acting as secondary factors.

HULDSCHINSKY[32] emphasizes the therapeutic value of feeding ruminating children sticky food and reports a case in a 6-months-old infant cured in this way. He thinks habitual vomiting in children of neuropathic constitution is often the basis for rumination.

SCHIPPERS[33] reports two cases. He considers briefly the main points of interest concerning rumination.

MCCLURE[34] reports a typical case in a 6½ months infant. Cure was brought about by feeding semisolid food.

SCHÜTZ AND KREUZFUCHS[35] report rumination in an adult case, the condition having existed since childhood. There was no evidence of a neuropathic constitution. Roentgen-ray examination showed an hourglass stomach with some evidence of irritation at the pylorus. In the short bibliography are collected references to articles on rumination in which roentgen-ray findings are of special interest.

LEHNERDT[36] obtained marked improvement in a ruminating child of 7 months by feeding sticky food. A neuropathic constitution was supposed to have been the actual cause of the condition. At necropsy, following a subsequent bronchopneumonia, there were no pathologic findings except in the lungs. No bibliography.

WANIETSCHEK[37] studied a ruminating child for seven years and was never able to cure the condition. Subsequently following diphtheritic pharyngeal paralysis, rumination ceased and never recurred, although the paralysis was only temporary. He reviews the articles of Aschenheim, Mayerhofer, Schlesinger, Maas, Lust, von Gulat, Comby, Wirtz and Huldschinsky.

LEMOINE AND LINOSSIER[38] in their first article give a brief account of the anatomic mechanism of rumination, in animals, comparing it with what they consider to be the identical process in man. Their second article contains a long consideration of rumination in man and also a full case report, with details as to etiology, symptomatology, mechanism and pathology. They consider rumination to be a nervous gastric condition with regurgitation as a reflex act. Bibliography.

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31. Brüning: Beitrag zur Kenntnis des Wiederkäuens im Säuglingsalter, Ztschr. f. Kinderh., **60**:116, 1913.

32. Huldschinsky: Zur Therapie der Rumination in Säuglingsalter, Ztschr. f. Kinderh., 1913, **8**, No. 5, p. 363.

33. Schippers, J. C.: Zur Sogenannten Rumination in Säuglingsalter, Ztschr. f. Kinderh., **10**:92, 1914.

34. McClure, W. B.: Neurotic Vomiting in an Infant, AM. J. DIS. CHILD., **7**:48, 1914.

35. Schütz, E., and Kreufuchs, E.: Ein Fall von Rumination mit dem Röntgenbefund eines Sanduhrmagens, Wien. klin. Wchnschr., **1**:699, 1914.

36. Lehnerdt: Zur Kenntnis der Rumination in Säuglingsalter, Jahrb. f. Kinderh., **82**:66, 1915.

37. Maas: Zentralbl. f. Kinderh., **12**:11, 1917.

38. Lemoine, G., and Linossier: Note sur le méchanisme de la Rumination chez l'homme atteint de mérycisme, Compt. rend. Soc. de biol., Paris, March, 1893, p. 339; idem., Contribution à l'étude du mérycisme chez l'homme et en particulier de son mécanisme, Rev. de méd., Paris, March, 1894, p. 177.

DUVIVIER[39] discusses rumination in a 16-year-old child in whom there were many evidences of a neuropathic constitution. No abnormalities were found in the physical examination. He considers the mechanism to be that of vomiting. He believes that slow eating will do much in preventing the occurrence of rumination.

We wish to acknowledge our indebtedness to Dr. E. A. Parks for his cooperation and stimulating encouragement in this work.

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39. Duvivier, M. L.: Notes sur un cas de Mérycisme, Echo méd. du nord., Lille, February, 1900, p. 90.

# A CASE OF CARDIOSPASM

## FOLLOWED BY HYPERTROPHY, DILATATION, AND STRICTURE OF THE ESOPHAGUS, TREATED BY GASTROSTOMY, AND SUBSEQUENT DILATATION OF THE ESOPHAGEAL STRICTURE *

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The case here reported is of special interest for several reasons. The diagnosis of cardiospasm is made because clinically the element of spasm is unquestionably present, the food entering the stomach at certain times very much better than at other times. Sodium bicarbonate and sodium bromid seemed to assist in causing the food to enter the stomach. The diagnosis of stricture of the esophagus is verified by roentgen-ray plates, the first plate showing a thin stream of barium just entering the stricture, with a dilated portion of the esophagus above the stricture; the second plate shows the barium in the lumen of the stricture, and the third plate shows the barium meal just entering the stomach. Another point of special interest is that the diagnosis of ulcerative esophagitis was made by direct inspection with the eye, the esophagoscope being passed by Dr. Chevalier Jackson and the ulcerated area being clearly seen.

The treatment by gastrostomy, feeding the child through a tube for several weeks, nothing being allowed by the mouth except small quantities of water, is also of interest, and finally the treatment by dilating the stricture of the esophagus by sight, and not by touch, the esophagoscope being passed, and Dr. Jackson passing bougies—small, delicate bougies at first—by sight, and not according to the old method, in a blind manner.

I might also say that there is now in the Jefferson Hospital another child with a stricture of the esophagus caused by the swallowing of lye, who is being treated in the same manner—gastrostomy, feeding by a tube inserted into the stomach, and the stricture being dilated by bougies passed through the esophagoscope, the operator clearly seeing the small opening remaining in the esophagus, and consequently being able easily and quickly to insert the small bougies into this opening.

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* Read at the meeting of the American Pediatric Society, Lenox, Mass., May, 1918.

## REPORT OF CASE

*History.*—The history is that of a boy, George S., who first came under my observation Sept. 4, 1916. He was then 4 years and 10 months of age. He was apparently healthy at birth and had one sister 10 years of age, healthy and strong. There were two miscarriages since the birth of George, the first without any apparent cause, the second due to a fall.

The child was put to the breast a few hours after birth, was nursed for one month, and vomited after the first nursing. This vomiting had continued ever since. He usually regurgitated or vomited immediately after eating. He suffered from habitual constipation. He spat up his food within a few seconds after swallowing it; would eat quickly and swallow without any difficulty any food given to him, but regurgitated it in from a few seconds to a few minutes. Occasionally he had pain, usually at night, and commonly in the region of the ensiform cartilage and epigastrium. A few weeks prior to admission, the mother informed me, the boy was given a 5-grain capsule filled with barium, and that this was seen fluoroscopically to pass into the stomach without difficulty. As a rule he had no trouble swallowing liquids, although occasionally he regurgitated liquids, but he always regurgitated all foods except liquids. There was no abdominal distention, and only occasional abdominal pain.

The boy was decidedly rhachitic, did not creep until he was 15 months old, and first stood alone when he was 18 months old. He was born in November and was kept in the house until the following July.

When 8 months old he was fed on condensed milk for one month, and vomited very little. The vomiting then gradually returned. This was the only time in his life that he ever went more than twenty-four hours without vomiting, and he had never gone for twenty-four hours without vomiting when he was given anything except liquid food. Weight 32 pounds, 5 ounces. He had only had one attack of diarrhea, and this lasted only three days. He was never drowsy or toxic. He was put on an absolutely liquid diet, with small amounts every three hours, and was given 3 grains of sodium bicarbonate before each feeding, and 5 grains of sodium bromid three times a day.

Oct. 11, 1916. The child was given a little zweibach every day, and only vomited it twice. This was the first time that he ever retained any solid food. Sodium bromid and bicarbonate were continued.

Oct. 18, 1916. Given five feedings a day—milk, clear broths, zweibach, crackers and butter, raw egg, and a little cereal; vomiting decidedly less; weight, 33 pounds, 9 ounces.

Oct. 25, 1916. Suggestion was tried. He had an inclination to spit up after each feeding, but if his mind was occupied, that is, if he was made to count, or if he was told a story, or told that he must not spit up, he would very often not vomit. The mother said that she believed the condition was mental. If she sat with him for an hour or so each day and told him not to vomit, the vomiting was controlled to a certain extent. There was always a great deal of mucus that came up with his food. The mother said that it was "not the food but the child." Sometimes after taking the food, the boy would say, "I must spit." Sometimes he would put his hand to his throat and look distressed, and at times would spit up the food, or at other times this distressed look would suddenly disappear, and he would be able to finish his meal without trouble. Weight 36 pounds.

March 28, 1917. If the boy was given only a liquid diet, and the bicarbonate of soda and bromids, he had gone as long as one week without spitting up anything. Before spitting up any food he was apt to cry, and say, "I want to spit." Sometimes he could be diverted; at other times he could not, but he could always hold the food two or three minutes until his mother could bring him a basin to spit in. This delay was intentional on the part of the mother. Weight, 38 pounds.

For some weeks he had been taking small doses of bismuth subnitrate with the hope of healing the ulceration of the esophagus. A Wassermann was negative, and a tuberculin test negative. An examination made by Dr. Philip B. Hawk of the Jefferson Medical College showed that the food he spat up immediately after swallowing it did not reach the stomach, but the food that he spat up some minutes after it had been swallowed had reached the stomach.

The boy is at present in my ward at the Jefferson Hospital, and his general condition is very satisfactory.

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# PROGRESS IN PEDIATRICS

## REVIEW OF LITERATURE ON RESPIRATORY DISEASES *

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Reviewing the literature on respiratory diseases one comes to the inevitable conclusion that, with the exception of pneumonia, very little work of a progressive nature has been done. Laryngologists have added to our knowledge of the presence of foreign bodies in the lungs, but otherwise no addition has been made to this wide and important field.

### PNEUMONIA

Mitchell[1] summarizes the results of his studies on ninety cases of pneumonia, eleven of which were of the bronchopneumonic variety and none secondary or terminal, with the following conclusions:

1. The so-called fixed types of pneumococci are of infrequent occurrence in infants and children as compared with adults, and the mortality with these types is lower.

The pneumococci without definite agglutination reactions (Type 4) are of more frequent occurrence in infants and children (74.4 per cent.).

3. Type 4 pneumococcus often causes as severe a type of infection as the fixed types and seems to be the cause most frequently in bronchopneumonia.

4. Complications are more frequent with the Type 4 infection.

The work on the allergic skin reactions with the type strains of pneumococci has proved that little help may be had from this field in helping to differentiate the type strains. Steinfield and Kolmer[2] were able to get a reaction in 30 per cent. of a series of cases of lobar pneumonia following the intradermal injection of washed and heat killed pneumococci. True reactions were not observed among normal persons or those suffering with various chronic diseases. The presence of pneumococci in the upper air passages apparently

* Submitted for publication Dec. 5, 1918.

1. Mitchell, A. G.: The Types of Pneumococci in Infants and Children, Pennsylvania M. J., **20**:344, 1917.

2. Steinfield E., and Kolmer, J. A.: Allergic Skin Reactions in Pneumonia to Type Strains of Pneumococci. J. Infect. Dis., **20**:344, 1917. Prophylaxis of Lobar Pneumonia. Ibid., **22**:220, 1918.

does not sensitize, in so far as this condition is detectable by skin tests.

All reactions occurred after the crisis or after the infection had been present over a long period. There was no constant relation between the reaction to the protein of various types of pneumococci and the types found in the sputum. It is probable that the allergic reactions to pneumococcus protein are of a more general character than the agglutination reactions.

These two authors[2] in a further study contribute to the problem of the prophylaxis of pneumonia and draw the following conclusions: Experiments in vitro have shown the high pneumococcidal activity of varying dilutions of ethylhydrocuprein hydrochlorid, quinin bisulphate and other cinchona compounds in liquor thymolis for Type 1 and Type 4 pneumocci in the sputum of convalescents from lobar pneumonia and the mouth secretions from normal persons. As recent investigations in the epidemiology of lobar pneumonia have indicated that frequently the disease is transmitted by specific virulent types of pneumococci from a recovered person who still harbors in the mouth secretions the organisms responsible for the disease, or from a healthy carrier of pathogenic pneumococci, it is suggested that the systematic use by the patient and those in close contact with the disease of a mouth wash of 1 to 10,000 ethylhydrocuprein or quinin bisulphate 1 to 10 in liquor thymolis, may serve to destroy or inhibit the multiplication of the disease producing pneumococci and thereby aid in the prophylaxis of lobar pneumonia.

The value of ethylhydrocuprein in the treatment of lobar pneumonia has been investigated by Moore and Chesney.[3] The evidence submitted by them goes to show that ethylhydrocuprein (optochin) fulfills at least some of the requirements of a chemotherapeutic agent in the treatment of acute lobar pneumonia, its chief drawback being the possibility that it may, in some instances, exert a toxic action on the eye. The drug, even in great dilution, possesses a marked bactericidal action on pneumococci in vitro in the presence of human blood serum and whole blood.

In the second place, so far as may be judged from the present study, which comprises too few cases from which to draw final conclusions, it is capable of being absorbed from the gastro-intestinal tract into the blood stream in such amounts that a certain degree of pneumococcidal power may be maintained there for several days, provided the following conditions are fulfilled:

1. The amount of the drug given for each kilogram of body weight per twenty-four hours should be at least 0.024 gm. (amounts

3. Moore, H. F., and Chesney, A. M.: The Study of Ethylhydrocuprein (Optochin) in Acute Lobar Pneumonia. Arch. Int. Med., **19**:611, 1917.

smaller than this, as low as 0.02 gm., may be sufficient to produce bactericidal action in the serum, but they cannot be relied on to do so).

2. The size and spacing of the individual doses must be suitably arranged.

Measham[4] outlines the following method for the treatment of bronchopneumonia: The child's chest is enveloped in a light gamgee jacket and over this a pair of woolen combinations are worn. The bed is placed free from drafts, and not more than the usual amount of bed clothes is used. A fire is kept burning constantly and the window always open. The child is encouraged to take frequent sips of cold water, but no medicine is given by mouth. A subcutaneous injection of quinin hydrochlorid is given morning and evening. A solution is prepared in which 1 grain of the quinin salt is dissolved in 10 minims of water, the dosage of which is as follows: for a child under 6 months, 5 minims; for a child under 1 year, 10 minims; for a child under 2 years, 15 minims; for a child over 2 years, 20 minims. The treatment is easy to carry out and the hypodermic method has obvious advantages in dealing with small patients. It is not claimed that the use of the drug is original.

Fussell[5] enumerates six essential points which are applicable to practically every case of croupous pneumonia:

1. Early recognition of the cases, making allowances for the difficulty in diagnosing pneumonia early, nevertheless suspicious symptoms and signs are sufficient to put the case on whatever routine treatment is decided on. This prevents, at times, early exhaustion.

2. Rest. This must be absolute, mental as well as physical.

3. Fresh air. To the writer, the usual directions to keep the temperature of the room between 60 and 70 F. is a mistake. The temperature of the room should be that of the outside air. Protect the patient, and neither cold, drafts nor dampness will harm him.

4. Food. This should be of a character that does not readily undergo fermentation. Reduce food as distention ensues.

5. Constant watchfulness. See the patient twice a day, and always be in a position to hear from the nurse during the day.

6. The administration of the proper drugs at the proper time.

*Treatment of Special Symptoms.* — Fever: With a temperature range between 103 and 105 F., sponges and baths are not necessary, as it seems that that temperature for nine days is no more harmful than the disturbance which their administration involves. Cold may

4. Measham, J. E.: Notes on the Treatment of Bronchopneumonia in Children. Practitioner, London, **98**:581, 1917.

5. Fussell, H.: The Treatment of Croupous Pneumonia by Other Than Specific Methods. Pennsylvania M. J., **20**:351, 1917.

be applied to the head or the affected side of the chest. Coal tar antipyretics should never be used.

Delirium: This is best combated by fresh air and abundance of liquid. Morphin, in the violently delirious, is better than strapping.

Abdominal distention: Liquid food; give pituitary extract or eserin hydrochlorid hypodermatically; use turpentine stupes or a rectal tube.

Cohn and Jamieson[6] draw the following conclusions from an interesting study of 105 cases, none apparently, however, in children:

1. Digitalis acts during the febrile period of pneumonia.

2. It produces a beneficial, possibly a life-saving, effect in cases of auricular irregularity.

3. Whatever beneficial action it has on the normally beating, non-febrile heart may be expected from its use in the febrile heart of pneumonia.

### UNRESOLVED PNEUMONIA

Hess[7] grouped twenty-two cases discharged as such, though later this diagnosis, in some cases, was proved wrong. Of the eighteen patients he was able to follow during periods ranging from two months to four years, ten are living. These are divided into three groups, according to their present state of health:

Group 1. Five patients, who are in good health.

Group 2. Two patients, whose health is fair; one is still anemic after five years and one still showing dulness after five and a half months.

Group 3. Three patients are in poor health; one developed an empyema after leaving the hospital, with a slow convalescence; one is in a sanatorium for tuberculosis, while the other is still running an afternoon elevation of temperature and shows some dulness.

Group 4. Eight cases. All patients died.

Group 5. Four patients not found.

Hess's conclusions are as follows:

1. Tuberculosis is frequently a complicating, if not a primary, factor in many of the fatal cases and unquestionably a factor in delayed resolution of recovered cases.

2. Empyema, especially of the intralobular type, must be excluded in all cases.

3. Rare etiologic factors, as syphilis, foreign body, metastatic and primary new growths, while uncommon, must not be overlooked.

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6. Cohn, A. E., and Jamieson, R. A.: The Action of Digitalis in Pneumonia. J. Exper. Med. **25**:65, 1917.

7. Hess, J. H.: Unresolved Pneumonias, What Becomes of Them? Arch. Pediat., **34**:686, 1917.

4. The diagnosis of nontuberculous interstitial pneumonia should always be made with great caution and only after exclusion of all other conditions causing similar physical findings.

### COMPLICATIONS OF PNEUMONIA

British writers have reported some interesting complications in pneumonia. Ashby[8] presented a boy of 2 years who had a right upper lobar pneumonia. Two days before the crisis he became slightly delirious, but after the crisis instead of the usual sleep coming on he became more acutely delirious. After thirty-six hours of the acute delirium he showed slight improvement and two and a half days after the crisis became quite rational. The condition was quite distinct from the so-called cerebral pneumonia, in that he had no convulsions and the delirium became more acute after the crisis.

The following points of interest follow Tivey's[9] observation of a female child of 21 months, who had a left lower lobar pneumonia, and developed a distinct pericardial rub two days after the beginning of the illness, with death nine hours later: (1) the severe onset of the pneumonia with most acute symptoms, which largely abated in twenty-four hours; (2) the emphatic character of the friction rub; (3) the quickly fatal effect of the heart complication. The heart on previous examination showed no abnormalities.

Parkinson[10] presented a boy of 14 who had had a right lower lobe consolidation. After four days of illness the signs of consolidation were quite evident and that evening the temperature rose to 110 F. Relays of iced towels were applied to the chest and abdomen while the arms and legs were sprayed with cold water. In about an hour the temperature had fallen to 104 F. During the period of hyperpyrexia the boy was neither comatose nor delirious and his breathing not especially embarrased. Several hours later his temperature rose again to 109.5 F. and was again lowered by the same method, except that no iced towels were placed over the precordium. After this fall the temperature never rose above 105 F. Crisis occurred on the ninth day, and for the following week was subnormal, getting as low as 95 F. During the fever the pulse varied between 100 and 120 until the last two days, when it was about 90. At the crisis it fell between 60 and 70 and in two days fell to 44. It was then perfectly regular and it was possible to demonstrate by

8. Ashby, H. T.: A Case of Acute Delirium in Pneumonia. Brit. J. Child. Dis., **14**:111, 1917.

9. Tivey, E. A.: A Case of Pericarditis Complicating Pneumonia in an Infant. Med. J. of Australia, **1**:227, 1917.

10. Parkinson, J. P.: Acute Pneumonia with Hyperpyrexia Followed by Heart Block. Brit. J. Child. Dis., **14**: 1917.

a paper flag on the neck that the rate of the beat of the auricle was twice that of the ventricle. After two days, this two to one heart block altered, the pulse became more rapid and irregular, or rather intermittent, some auricular impulses still being blocked, but more coming through. The pulse now varied between 50 and 60. This condition gradually lessened and after another week the pulse became almost regular and the rate normal. This case was of interest because of the presence of two rare complications—hyperpyrexia and heart block. The former was stated to occur in 0.4 per cent. of cases of acute pneumonia, but was much more common in bronchopneumonia. Heart block after acute pneumonia was mentioned by Mackenzie, but he considered it very uncommon, and the experience of most pediatrists confirms this.

Comby,[11] in commenting on the necropsy findings of a right massive pneumonia in a 5-year-old girl, could scarcely conceive that as massive and solid a hepatization could take place in forty-eight hours. While this type is well known in adult life, it is the exception in childhood and its occurrence gives a grave prognosis.

Drew,[12] discussing the cause of death in acute pneumonia, pleads for the more frequent draining of the spinal canal. The poison, he is inclined to think, is absorbed by the nerve centers under pressure, and since it is known that intraspinal pressure is frequently if not always increased in acute pneumonia, it seems a rational procedure to allay the toxic symptoms by spinal tapping. The frequent complication of meningitis in fatal cases offers further support for this contention.

Valentine,[13] studying cases of common colds with no known exposure to pneumonia, found Type I organism predominating. This to her strongly suggests that it was the etiologic factor in these colds. If this is so, common colds must be looked on as a possible source of contagion in the development of pneumonia (lobar) due to Type I *Pneumococcus*.

### EMPYEMA

Richter[16] refers particularly to certain fundamental principles involved in determining how much to aspirate and when to stop aspirating. The simplest form of treatment is aspiration in a rational

11. Comby, J.: Pneumonia—Fulminating of Right Lung in a Girl of Five. Arch. de méd. d. enf., **20**:25, 1917.

12. Drew, H. V.: The Cause of Death in Acute Pneumonia. Brit. M. J., **1**:581, 1917.

13. Valentine, E.: Common Colds as a Possible Source of Contagion for Lobar Pneumonia. J. Exper. M., **27**:27, 1918.

16. Richter, H. M.: Interrupted and Continuous Aspiration in Simple Empyema. Arch. Pediat., **34**:696, 1917.

manner. To empty completely a pleural effusion of any size is essentially wrong. Given a pleura containing a pint of pus, not more than half the amount should be removed. Forty-eight hours later, perhaps, the greater part of what was left should be removed, and so on, until the pleura is well emptied in the course of three to six aspirations. It is not absolutely necessary to remove all. If the bacterial findings are satisfactory, the remaining fluid will clear up, though, he believes, with more deformity if too much is left. The removal of comparatively small amounts of pus disturbs mechanical conditions only slightly, reduces pressure because it reduces tension, no compensatory serous effusion is produced and the general condition is favorably influenced. After a second or third aspiration it is sometimes found that the temperature will suddenly rise and every evidence of increased intoxication will develop. This phenomenon is commonly looked on either as an evidence that the infection is not within our control, or that reinfection has occurred from repeated punctures. Neither assumption is necessarily correct. Obviously there is an increased activity of the infective process, but the mechanism of its production is different from that commonly assumed. The bacteria in pus are distinctly less active than those in the walls of the abscess. In the case of empyema, bacteria in the pus are practically killed before those in the pleural wall. The aspiration of too much pus produces, as already stated, further serous exudate which carries with it bacteria from the deeper tissues, which are still actively pathogenic, and it is from this source that we light up our pleural infection.

Layne,[17] on the contrary, admits of nothing but surgical treatment. He also complains as to the lack of data on the incidence of this complication in childhood. Hamilton[18] likewise takes the stand that all empyemas should be operated on except some of the cold abscesses and the interlobar collections of sterile pus. Anatomic and physiologic differences in the child make the physical findings less typical than in adults.

Roth[19] claims to have solved the question of drainage in empyema by providing constant drainage with an intermittent self-regulating suction apparatus. It empties the chest quickly, facilitates the early expansion of the impaired lung, prevents excoriation of the skin, helps the function of the sound lung and makes minor thoracotomy

17. Layne, P. C.: Empyema in Childhood. Its Diagnosis and Treatment. Kentucky M. J., **15**:370, 1917.

18. Hamilton, H. B.: Empyema in Children. Nebraska State M. J., **3**:41, 1918.

19. Roth, I. R.: A New Bed Device for Facilitating the Drainage of Empyema Thoracis. J. A. M. A., **70**:1455, 1918.

usually sufficient. It is simple, sanitary and applicable to a child of any age.

Caille[20] calls attention to the infrequency of fatalities following puncture of the thorax, but deems it wise to call attention to the fact that the introduction of a needle into a highly congested lung is attended with some risk, especially when cardiac or respiratory failure is present. Two cases are cited, one a child of 2 years, the other an infant of 6 weeks. In both cases hemorrhage from the mouth and death ensued a few minutes after the introduction of the needle.

### THYMUS

Benjamin and Lange,[21] examining 225 children routinely, found nineteen with undisputed signs of thymic enlargement (8.47 per cent.). They claim the diagnosis is usually simple. The chief complaint is cough, as a rule paroxysmal. The prodromal symptoms of a cold are usually lacking. The coughing spells come on during the night in an apparently healthy child. Only on further cross examination is the information elicited that there is occasionally cyanosis and a tendency to choke. Most of the children are well developed and nourished. The lymphatic glands, other than the posterior cervical group, showed no hypertrophy, as a rule. The lungs were, generally, peculiarly free from râles.

The "Threshold method" of percussion was always employed. In this, the percussion is begun well out in the chest with such light strokes that when the ear is within a few inches of the area under percussion only the faintest resonance is heard. When sound disappears, dulness begins.

All cases showing enlarged thymus by physical examination, or in which there were suggestive symptoms, were submitted to Roentgen ray treatment, if in addition they showed positive plate findings. The treatment has proved most satisfactory.

Attention is called by the writers to the small number of cases of this apparently common illness which are reported; to the fact that the condition is of enough importance to warrant attention, and that early diagnosis and prompt treatment may eliminate most of the sudden deaths among infants and young children.

Friedlander[22] agrees in every particular with the foregoing statements and adds a needed warning about the necessity of care, both in the taking of the plate and the use of the ray in treatment.

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20. Caillé, A.: Hemoptysis Following Exploratory Puncture of the Chest. Arch. Pediat., **35**:524, 1918.
21. Benjamin, J. E., and Lange, S.: Report of Nineteen Cases of Hyperplasia of the Thymus Gland. Arch. Pediat., **2**:70, 1918.
22. Friedlander, A.: Enlargement of the Thymus Treated by the Roentgen Ray. Am. J. Dis. Child., **14**:40, 1917.

### ASTHMA

Webster[23] records twenty-eight cases of asthma divided into three groups: (1) those due to anaphylaxis-hay-fever—food poisoning; (2) those due to intrathoracic disease, particularly enlarged glands; (3) those due to a disturbance of the general metabolism. Three were in the first, four in the second and twenty-one in the third group. In five the first attack occurred during the first year of life, in twelve during the second, in six during the third, in five after the third year and all before the fifth year. In the treatment of the third group the essential thing is the diet. Reduce the fats and sugars in the proportion of the severity of the attacks or their resistance to treatment. He regards the iodids with more favor than either the salicylates or sodium bicarbonate.

### PHYSIOLOGY

No more interesting or worth while study of auscultatory phenomena has been made than that contained in the tenth report of the Henry Phipps Institute. Some of the subjects are presented by Montgomery[24] in a separate paper in which he offers explanations for auscultatory findings over the lungs and applies these principles to chest conditions.

*Solid Lung.*—This is the simplest clinical condition we have to study. In tracing the sound in the bronchi through the solid lung to the periphery of the chest, we find the factor of diffusion of sound everywhere operative. The activities of this factor are very much limited within the bronchi, because the bronchial walls, to a great extent, reflect the vibrations back into the interior of the bronchi, this reflective action in the small bronchi being even more powerful when the lung is solid than when it is normal. Once the vibrations have entered the bronchial walls, however, their further course is entirely pursued through tissue with its associated fluids, the solid lung and chest all forming, practically, a good single conducting medium which offers very little obstruction to the passage of the vibrations, so that nearly all the sound intensity that is lost en route from bronchus to periphery is due to diffusion. In no other common clinical condition do we find so little tendency to reduction of sound from reflection as when dealing with solid lung, and even the degree of diffusion is not greater than that ordinarily encountered. The voice sounds are therefore relatively loud, or, as we commonly express it, are increased in intensity over a solid lung.

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23. Webster, F. P.: Asthma in Children. J. Maine M. A., **7**:225, 1917.
24. Montgomery, C. M.: The Main Factors Affecting the Intensity of Sounds as They Pass from the Interior of the Lungs to the Periphery of the Chest. Am. J. Med. Sc., **153**:583, 1917.

*Pleural Effusion with Diminished or Absent Voice Resonance.*—The explanations for this phenomenon, when not entirely erroneous, have been either obscure or incomplete. The abnormal conditions encountered in a simple case are the presence of fluid within the pleural cavity and a more or less relaxed lung. The clinical fact that the vocal resonance above a pleural effusion is frequently increased indicates that the sound escapes from the relaxed lung to the adjacent tissues with more intensity than in the normal case. The evidence indicates that the sounds pass between the relaxed lung and fluid with about an equal intensity to that found in the passage of sounds between relaxed lung and tissue. Therefore, in these cases presenting an increased resonance above an effusion, we conclude that the vibrations entering the fluids are louder than those entering the chest wall of an individual with the lung in a normal state. Any loss of sound, then, except as noted below, encountered over a pleural effusion, must take place after the vibrations have entered the fluid. We have already seen that tissue alone, and fluid alone, and even the combination of the two, offer very little impediment to the passage of sounds. The loss of sound encountered over an effusion may be traced largely to diffusion, the result of the greater distance occurring between the lung and the chest wall overlying the fluid, as compared to the close approximation of the lung and the chest wall in the normal state. The sounds become weak for the same reasons that they do over the liver, because of diffusion and not reflection. The diminished vocal resonance is also due partly to the diminished caliber of the bronchi.

*Pleural Effusion with Increased Vocal Resonance.*—The explanations offered to account for the increased vocal resonance sometimes met with over a pleural effusion are few and for the most part unsatisfactory. In some cases this is due to the fact that the fluid adjoins a lung which is solid. The lung may be solid, due to the absence of air in the vesicles, as when it assumes the fetal type after a prolonged collapse; or it may be solid because of inflammatory or other products in the vesicles. It is important that no air remain in the pulmonary parenchyma. When the solid lung is separated from the chest wall by fluid, there is very little reflection or other form of obstruction to the passage of vibrations on their way to the periphery of the chest after they have entered the bronchial wall. If, then, the diffusion is limited, the conditions are very much the same as solid lung unassociated with fluid. Whatever the degree of diffusion due to separation of lung from chest wall, and other factors, the conditions are very much the same as though tissue replaced fluid. The explanation is entirely satisfactory when the solid lung is separated from the chest wall only a short distance, but it is well known

that very large effusions on either side of the chest separating the lung a great distance from the chest wall and thereby greatly increasing the diffusion between the lung and chest wall, may furnish striking examples of increased vocal resonance. In some such cases it seems likely that some vibrations are received at the periphery, coming straight across through the fluid from the trachea. The physical conditions are certainly favorable for this; that is, the fluid may be present in the upper part of the pleural cavity, so that in this course of the vibrations from the trachea to the chest wall no air intervenes, but only tissue and fluid.

Peabody and Wentworth[25] have established a standard "vital capacity" of the lungs. When compared to the proper standard this capacity rarely falls below 90 per cent., although it may rise considerably above the normal. This they claim to be of positive value in giving quantitative information as to the tendency to dyspnea, and thus, indirectly, as to the clinical condition and the reserve power of the patient. In various circumstances in which mechanical conditions interfere with the movements of the lungs the tendency to dyspnea corresponds closely to the decrease of the vital capacity. In diseases in which dyspnea is not a prominent symptom the vital capacity is usually within the normal limits.

### FOREIGN BODIES IN THE LUNGS

Jackson[26] believes that the asthmatic wheeze elicited by oral auscultation is a distinct addition to our diagnostic means in cases of foreign bodies in the trachea and bronchi. This sound is a wheeze heard by placing the ear in front of the patient's mouth during expiration. It is like the wheezing of an asthmatic patient but drier. It is caused by the vibrations of air passing through the bronchus. It is of more value directly as to the recent occurrence of the case and is often more marked after coughing out all secretions. Jackson feels that we have a sign which promises to be of great value in many cases in which the foreign body is not opaque to the ray.

Walters[27] draws a lesson from a case which bears repetition; that is, pay attention to the statements a patient makes. A 9 year old boy swallowed a bone. Shortly after, he developed a hacking cough and the family physician's diagnosis of tuberculosis was confirmed over and over again by any number of eminent physicians during the next eleven years. Ordinary plates revealed nothing and not until stereo-

25. Peabody, F. W., and Wentworth, J. A.: Clinical Studies on the Respiration. Arch. Int. Med., **20**:443, 1917.

26. Jackson, C.: New Diagnostic Sign of Foreign Body in the Trachea or Bronchi. The Asthmatoid Wheeze. Am. J. M. Sc., **166**:625, 1918.

27. Walters, P. R.: Foreign Body in Lung Removed After Eleven Years. California State M. J., **16**:42, 1918.

scopic plates were made was the foreign body located. This was successfully removed and the boy is well on the way to a permanent recovery.

Eves[28] protests against the blind methods of pushing old probangs down the esophagus for the dislodgment of a foreign body, which he says are still followed.

### BACTERIOLOGY

Mathers,[29] as a result of a study of sixty-one cases of respiratory infection which closely resembled in its clinico-anatomic manifestations and epidemiology so-called true influenza, found the influenza bacillus in only one instance. On the other hand, virulent hemolytic streptococci similar to those associated with septic sore throats of the epidemic type were found in the nose, throat and pharynx of forty-six patients, and in the blood in three cases of this epidemic disease. The predominance in the discharges from the nose, throat and pharynx of patients suffering from this epidemic respiratory infection of a virulent hemolytic streptococcus not usually found in the normal mouth, the absence of the influenza bacillus and the character of the associated pathologic changes, suggested that this disease was caused by a virulent hemolytic streptococcus.

### MISCELLANEOUS

Chapin[30] reports the results of a combined study of physical signs and roentgenograms on ninety-seven cases, viewed from the standpoint of the lungs. In all but twenty-three there was substantial agreement. As examples of the latter, five gave roentgenographic evidence of lobar pneumonia which was not detectable by physical signs; two gave physical signs which were not confirmed by the roentgen ray; three showed physical signs of bronchopneumonia not disclosed by the ray, and two failed to show the presence of fluid in the pleural cavity where it was shown by the plate.

A desire for a more accurate means of diagnosis in croup led to the adoption at the Willard Parker Hospital of the laryngeal speculum, because it was felt that many of the croup cases were not diphtheria. The advantages claimed by Gover[31] for the direct examination method are: (1) in deciding as to the administration of antitoxin in a

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28. Eves, C. C.: Removal of Foreign Bodies by Direct Bronchoscopy and Esophagoscopy. Pennsylvania M. J., **20**:687, 1917.

29. Mathers, G.: The Bacteriology of Acute Respiratory Infections Usually Called Influenza. J. Infect. Dis., **21**:1, 1917.

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case that presents no membrane in the fauces; (2) the necessity of establishing quarantine; (3) to avoid mistaking a foreign body in the larynx for croup; (4) as to the necessity of intubation, one may wait with safety for much more marked symptoms of obstruction in a catarrhal croup than in one of a membranous type.

Pisek[32] reports a case of chylothorax in a 9 weeks infant, the youngest on record, which when last seen was in good condition.

The Bureau of Child Hygiene of the Department of Health of the City of New York and the New York State Commission on Ventilation[33] conducted jointly an interesting inquiry into the possible relationship between respiratory diseases among schoolchildren and classroom ventilation.

During the late fall, winter and spring, 5,533 children in seventy-six class rooms and twelve schools were kept under observation. As a result of this study the following conclusions were drawn:

In the closed window, mechanically ventilated type of classroom, kept at a temperature of about 68 F., the rate of absences from respiratory diseases was 32 per cent. higher than in the naturally ventilated type with open windows, kept at the same temperature; and about 40 per cent. higher than in the open window naturally ventilated type kept at a temperature of about 50 F.

Children in closed class rooms with closed windows and mechanical ventilation are more subject to respiratory diseases, severe enough to keep them from school, than are children in the class rooms which are kept at the same or lower temperature and ventilated wholly by open windows. This is equally true of respiratory diseases not severe enough to keep them from school.

The relative humidity of class rooms, whether ventilated naturally or by mechanical means, is not a causative factor in the incidence of respiratory diseases among school children.

Ellis[34] adds a case in a boy of 8 years to eighteen cases of what appear to be certain cases of absence of one lung. The condition is rare. Therenim found only two cases among over 30,000 necropsies in a foundling asylum in Petrograd.

The clinical findings were as follows: chest expansion fair but diminished on the left side; over the left side of the chest, posteriorly, except at the apex, there was dulness extending to the midaxillary line; tubular breath sounds heard posteriorly as far as the midline

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34. Ellis, A. G.: Congenital Absence of One Lung. Am. J. Med. Sc., **154**:33, 1917.

of the left side; right lung showed no dulness. The apex of the heart was displaced to the left as far as the midaxillary line, the right border being 2 inches to the left of the sternum. A blowing systolic murmur was present, heard best at the apex and transmitted to the left. The heart sounds were heard well over the area of dulness posteriorly. A provisional diagnosis of acute articular rheumatism and endocarditis was made.

The necropsy notes bearing on the condition reported were as follows: diaphragm at the fifth space on each side; the left lung is absent; the right lung extends well beyond the costochondral junction, the large pericardial sac occupying the remainder of the thorax; the left branch of the pulmonary artery and the left pulmonary veins were absent.

The immediate cause of death was vegetative valvulitis with hydropericardium. Of the nineteen cases collected, thirteen were of the left, six of the right. Interference with the blood supply in early embryonic life is supposed to be the cause in all cases.

In an infant welfare station M. La Ferle[35] kept groups of infants under observation for periods of about three months, seeing them weekly. She decided that one half of them suffered at least once from a respiratory infection, with at least temporary loss of weight.

### NEW GROWTHS

Two cases of sarcoma of the anterior mediastinum were reported by Guidi.[36] In both cases there was no tendency to extension into the posterior mediastinum. The diagnosis was made chiefly on the rapid extension of the mass, the secondary glandular involvement of the neck and axilla, and finally, the undue prominence of the sternum.

Parkinson[37] reports a case of primary sarcoma of the lung in a 5-year-old boy. Orthopnea and much dyspnea were the principal symptoms, while dulness of the entire left chest and marked limitation of respiratory movement were the chief physical signs when first seen. At necropsy the entire left lung was a mass of soft, friable, hemorrhagic, small round cell sarcoma.

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35. La Ferle, M.: Respiratory Infections in Infants Attending a Welfare Station. Pediatria, **25**:469, 1917.

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